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ABSTRACT

Utilizing a data base obtained from a survey commissioned by Congress in 1964 and carried out in 1965, this study attempted to discover what characteristics of the nation's schools are most closely related to school outcomes. Methods were devised by which school influence could be distinguished from social background influences. A five percent stratified cluster sample was taken from a population consisting of the students, teachers, principals, and superintendents of the nation's public elementary and secondary schools. Since one of the purposes of the study was to determine the educational opportunities of minority groups, strata with higher percentages of nonwhites and other minority groups were sampled more heavily. One of the principal findings of the study was that the influence of the school cannot be separated from that of the student's social background. Additionally, the study found that the common influence of the school and the student's social background exceed either of their distinguishable influences. Other findings are discussed, and conclusions are drawn. (Author/JF)

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A STUDY OF OUR NATION'S SCHOOLS

by

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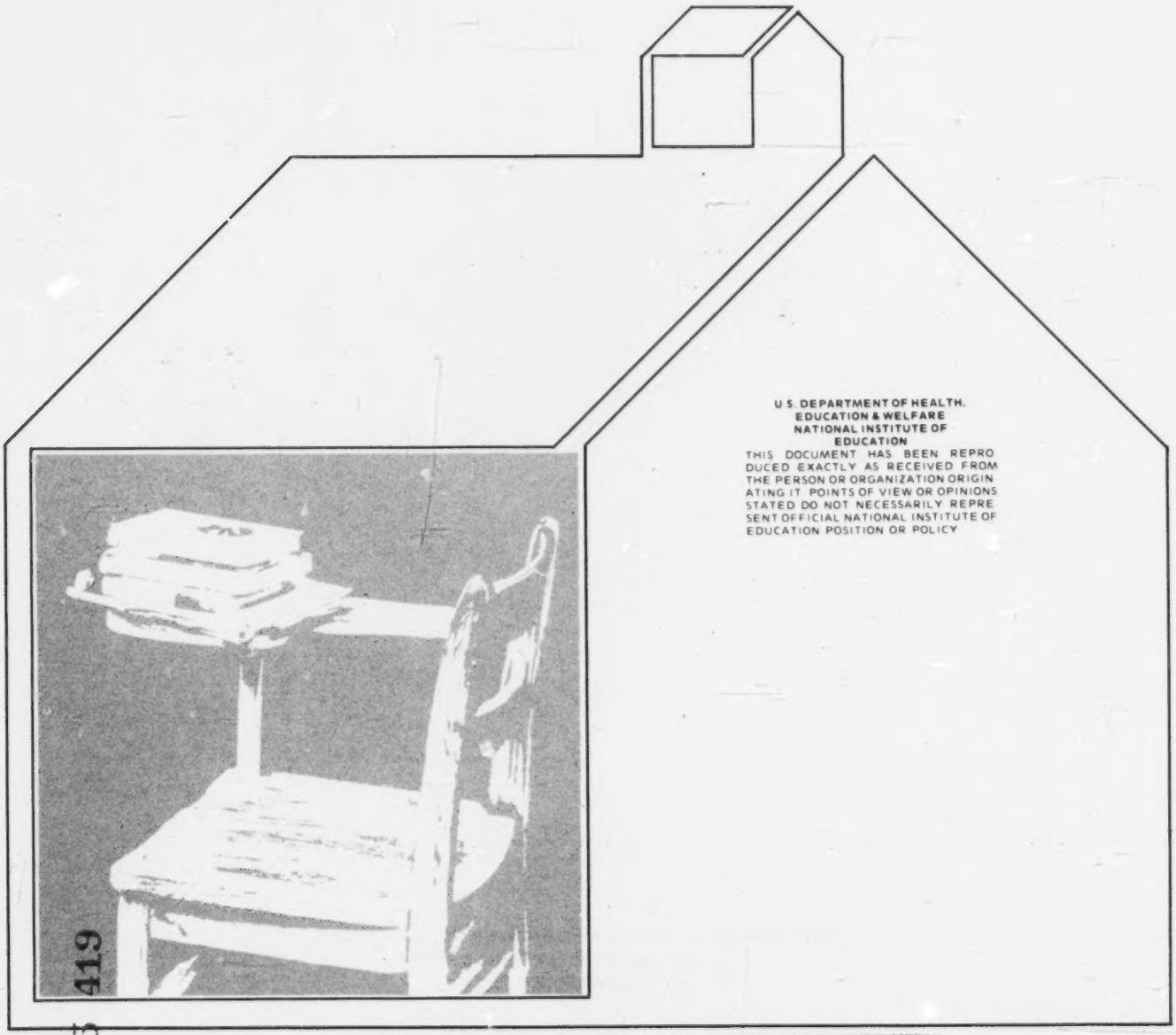
With a Foreword by Alexander M. Mood



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Foreword

I am pleased to be permitted to write the foreword to this monograph because it impresses me as an extremely able and thorough analysis of the Equality of Educational Opportunity Survey data from the point of view of differences in schools. It is gratifying confirmation of the value of these data to those of us who collected them in the belief that they would prove a mine of information about the American system of public education.

Speaking very roughly, when one looks at the variation in achievement scores between pupils, about 65 percent of it occurs between pupils in the same school and about 35 percent of it occurs between schools. This monograph is not concerned about variations within schools. It is concerned only with the 35 percent of the variation that occurs between schools. It endeavors to relate the characteristics of the schools to these variations of achievements between schools. A subsequent monograph will deal with variations within schools.

The analysis follows the same broad design that was used in the Equality of Educational Opportunity report.[1] But here time allowed it to be done very expertly, whereas originally it had to be done very hastily. The two important characteristics of the design are first, that the large number of independent variables are grouped into a small number of groups, each of which has some intuitive meaning for educators; and second, that the analysis uses proportion of variance explained as the primary means of interpreting the data, instead of the more familiar regression coefficients.

A novel aspect of the analysis is the use of criterion scaling. Criterion scaling is a device which transforms an independent variable so that its relation to the dependent variable will be exactly linear. It is a transformation that uses up a certain number of degrees of freedom, and in so doing it puts all the explanatory power of that independent variable into linear regression. Perhaps it will assist our intuitive grasp of the idea to suppose that the dependent variable depends on a third-degree polynomial, to all intents and purposes, in the independent variable. If we calculated an ordinary regression equation of the dependent variable against a third-order polynomial in the independent variable, we would have to evaluate four coefficients in the polynomial and would therefore use up four degrees of freedom. This regression would remove all of the variations in the dependent variable that the independent variable is capable of removing. We may think of criterion scaling as essentially transforming the independent variable by the same third-order polynomial. After that transformation, the dependent variable is related to the transformed independent variable by a simple linear relation that removes all of the variations in the dependent variable removed by the third order of polynomial. This device is particularly useful for the kind of analysis we are interested in doing with these educational data. We are little interested in regression coefficients or whether the regression is linear, quadratic, cubic, or whatever shape. We *are* interested in the total amount of variation in the dependent variable that can be associated with the independent variable. The rationale for this viewpoint will be discussed below.

The next step in the analysis was to group the large number of independent variables into a few groups. This is not a straightforward objective process but a combination of analytical methods and judgment. As it was done in this monograph, it makes for a beautiful piece of data analysis. The necessity for it lies in the fact that it is impossible to get an intuitive grasp of the importance of a single independent variable among several hundred others when it is correlated with a great many of these others. The traditional technique for handling this situation is factor analysis. When one tries to do factor analysis with educational data, he often finds that the resulting groupings do not make a great deal of sense from the practical point of view. That is, one factor may contain variables that pertain to teachers, other variables that pertain to pupils, and still others that pertain to the school facilities. That kind of factor is not very useful for understanding the educational process or trying to improve it. Nor are such factors very handy for designing experiments to explore the nature of the educational process. The grouping developed by this study used factor analysis, but not to the point of forming groups of variables that cut across the basic concepts educators find useful in describing and understanding the educational process.

Now let us turn to the nature of quantification in such a complex field as education. The numbers dealt with in these analyses are, of course, nothing like the measures that physical scientists or engineers have. Their numbers measure properties of very definite objects and often readily visible objects which have undeniable dimensions, density, temperature, and so on. Education measures are not even comparable to the measures that economists use. There is great specificity to the dollars per hour that a laborer earns, or to the number of automobiles turned out in one year by a manufacturing plant, or the number of ounces of gold removed from Fort Knox last year. The numbers of economics are definite measures of definite variables and, while a few of them are arbitrary indexes, their specifications are agreed upon by economists and educated laymen.

The numbers that we are dealing with in these educational studies are not direct measures, they are simply indicators. When a child takes an achievement test in arithmetic, the resulting score is only an index of what he knows about arithmetic. There is often a great deal of argument about the meaning of that index. In fact, one can find on the market a variety of tests representing different views of what should be emphasized in assessing

[1] J. S. Coleman et al., *Equality of Educational Opportunity*, National Center for Educational Statistics, U.S. Government Printing Office, Washington, D.C., 1966, Catalog No. FS 5–38001.

a student's knowledge of arithmetic. Similarly the independent variables relevant to education are, by and large, simply indicators. For example, an index of the socioeconomic status of a child's family may be made up of estimated family income, years of education of the parents, number of books and magazines in the home, and whether or not there are certain objects in the home (television sets, a telephone, household appliances, etc.). Such an index does not measure anything remotely tangible about status. Certainly the number of years of education of a parent says very little about how educated he is. Nor does the presence or absence of various gadgets really measure economic status. The fact that we must deal with these indicators, these hazy numbers that do not directly measure what we have in mind, should warn us against attaching much importance to regression coefficients. For example, one of the items of information in the Equality of Educational Opportunity Survey had to do with whether or not there was a dictionary in the home. That item enters with nontrivial weight into the index of socioeconomic status. Obviously the regression coefficients relating educational achievement to socioeconomic status do not imply that one can carry out a tremendous educational accomplishment at a very low price simply by placing a dictionary in every home. This is why we could not grant much significance to regression coefficients in the original analysis of the Equality of Educational Opportunity data, and also why the authors of this volume have not dealt with regression coefficients. Instead, they have associated variations in achievement with variations in these indicators.

The fact that the analysis must deal with indicators instead of more direct measures also justifies the use of criterion scaling. The square of an indicator or the logarithm of an indicator is simply another indicator. There is little point in exploring whether educational achievement is related linearly or not to an ad hoc indicator. The interesting question is whether or not any part of the variation in educational achievement can be associated with a given indicator and, if so, how much? When this report examines how much, it may find more than the original analysis found in otherwise comparable situations because achievement will have higher correlation with a criterion-scaled indicator than with the linear component of the indicator. But perhaps it is misleading to compare these two analyses at all. This one, unlike the first, deals only with school-to-school differences, and handles ethnic groups quite differently.

It is important to examine another aspect of criterion scaling. But first we need to consider briefly the problem caused by correlations between independent variables. It is a problem that complicates data analysis in any field of social science and is especially troublesome in education. As an example let us suppose we are examining the relation of student test scores (T) to two indicators: teacher quality (Q), and socioeconomic status (S) of the community in which the school is located. Purely for illustrative purposes, let us assume that a regression of T on Q alone removes 25 percent of the variance of T, that a regression on S alone removes 20 percent, and that the regression of T on Q and S jointly removes 30 percent. There is a high correlation between Q and S so that, while S alone removes 20 percent, when S is added to the regression on Q it merely raises the reduction in variance from 25 percent to 30 percent. The "unique" part of the variance removed by S is thus said to be 5 percent. What this means is that the part of the 30 percent that Q does not remove is considered to be uniquely associated with S. Similarly when Q is added to the regression of T on S, it raises the variance removed from 20 percent to 30 percent. Hence the unique part of the variance of T removed by Q is 10 percent. Finally, then, the 30 percent of variation in T removed by the joint regression on Q and S may be broken down into three parts as follows:

5 percent that is uniquely associated with S;
10 percent that is uniquely associated with Q;
15 percent that may be associated with either S or Q.

The third figure (sometimes called the common part, or "commonality," in the report) is obtained by subtracting the first two from 30 percent. The first and third added together then give the proportion of variance associated with S, while the second and third give the proportion associated with Q.

The correlation between Q and S thus leads to a certain frustration in trying to analyze and understand the data. From the point of view of attempting to control or improve the educational process, it would be helpful to be able to say something more definite about that 15 percent than that it may be associated with either S or Q. Unfortunately there is no possibility of breaking the 15 percent down into parts that can be attributed to one or the other of S or Q.

The analysis carried out in the first Equality of Educational Opportunity report used the technique of partitioning variance into unique and common parts. At the time we were doing them we thought these calculations were a novel contribution to data analysis. Later, we found that others had been doing the same thing at about the same time. Excellent discussions of the technique, together with significance tests and illuminating examples, have now been published by Newton and Spurrell.[2]

The original analysis, however, concentrated on determining the relative importance of various factors. To assist educators to make judgments of relative importance, considerable effort went into computing the unique parts of variation associated with given factors. These unique parts provided them with evidence in addition to the usual evidence provided by correlations. The present report goes much further than that. It presents not only the unique parts but all combinations of common

[2] R. G. Newton and D. J. Spurrell, "A Development of Multiple Regression for the Analysis of Routine Data," *Applied Statistics*, Vol. 16, pp. 51–64 (1967); R. G. Newton and D. J. Spurrell, "Examples of the Use of Elements for Clarifying Regression Analysis," *Applied Statistics*, Vol. 17, pp. 165–172 (1968).

parts. Thus one can tell at a glance the extent to which a factor overlaps another factor, and how those overlaps change when a factor is added to or deleted from a set of factors.

What is the effect of criterion scaling on calculations of unique and common parts of variation associated with two independent variables? There is no simple answer because the effect depends on the nature of the correlation between the two. The criterion scaling will certainly increase the amount of variation associated with each independent variable separately. It will also increase the amount associated with the joint regression. The effect on the two unique parts and on the common part may generally be that all three will be increased inasmuch as their sum will certainly be increased. However it is a reasonable speculation that the unique parts may be increased rather little by the criterion scaling, and that most of the total increase may fall in the common part. There are two reasons for this. First, we may expect that there will be a correlation between the nonlinear parts of the independent variables. Second, it is just as reasonable to expect that there will be a correlation between the linear component of one and the nonlinear component of the other. If this is correct, then some fraction of what was in the unique part on the linear analysis would be transferred to the common part on the criterion scaling analysis. Hopefully, these speculations may receive a little attention from theoretical statisticians in the near future.

I cannot conclude this foreword without paying tribute to former Commissioner of Education Francis Keppel, without whose efforts we would not have the Equality of Educational Opportunity data at all. Soon after he assigned to me the task of carrying out a survey of the equality of educational opportunity in the public schools, it occurred to me that it would be worthwhile not only to document the inequalities, but to try to determine which of them were more important and which less important for the student's learning. I realized of course that for such an investigation it would be necessary to give achievement tests to a sample of students. Mr. Keppel agreed that achievement testing would add a valuable dimension to the survey, but he foresaw that this addition would not be wholeheartedly supported by the educational establishment. Many educators cling closely to the idea of local control of education. Mr. Keppel correctly predicted they would be very dubious of any effort on the part of the Federal Government to test individual students.

Before coming to a final decision about the matter Mr. Keppel discussed it with several prominent members of the world of education. He found their reactions to be somewhat more negative than positive. But he decided that the chances were not hopeless, and that even partial success would be of such value that we should go ahead with the project. Then he personally, or his deputy, Henry Loomis, took it upon themselves to discuss the achievement testing aspects of the survey with every Chief State School Officer in the Nation. They explained carefully what we had in mind, which was not to evaluate schools, or teachers, or State educational systems, but simply to get some data on the basis of which one could determine which deficiencies of the educational system seemed to be particularly important to learning. The survey occurred at a time when the Federal Government was beginning to allocate a great deal of money to low-income school districts under title I of the Elementary and Secondary Education Act of 1965. It seemed worthwhile to us to let the survey serve the secondary purpose of developing information by means of which these districts might be given some clues as to how the money might best be spent. In any case, the efforts of Mr. Keppel and Mr. Loomis were quite successful, and most Chief State School Officers gave good support to the survey. The few that did not support it did not actually oppose it; they simply stood aside and left it up to the localities as to whether they would participate in the survey or not. The actual participation rate was about two-thirds. Without Mr. Keppel's heroic efforts it would have been very much lower than that, and probably could not have been carried out at all.

Once Mr. Keppel committed himself to making the survey a fundamental exploration of the nature of educational opportunity, all manner of happy events ensued. Most importantly, it became an easy matter to persuade the distinguished sociologist, James S. Coleman, to join the enterprise as director. Soon thereafter another distinguished sociologist, Ernest Q. Campbell, was persuaded to join him as codirector. A number of America's most eminent educators joined in as advisors. Educators all over the land cooperated to make the survey a success. I cannot recount here the whole sequence of events, but certainly this volume is the latest outstanding element of the sequence. All persons concerned with the quality of education will be in debt to Dr. George Mayeske and his colleagues for their thorough analysis of the school aspects of the survey information.

ALEXANDER M. MOOD

University of California at Irvine

Preface

This report has two main purposes: (1) to serve as a reference source by summarizing and displaying structural properties of the data; and (2) to show the extent to which the structural properties of the data will permit answers to be obtained about the possible influences that schools may have on their students. No attempt is made here to integrate these results with findings from other studies. For this, a separate work is needed. Meanwhile, the reader is referred to the reviews of the literature on school achievement by Lyle (1967) and Dyer (1968), and to the publications of the American Educational Research Association. The literature on desegregation research has been reviewed by Weinberg (1968) and that on social factors in learning by Boocock (1966).

It should also be pointed out that this report is addressed in the first instance to research personnel engaged in studying school influences. We, therefore, included chapter 1, to show what importance we feel our findings have for those who are not researchers. The same findings are summarized at somewhat greater length in chapter 11. Chapter 11 contains the technical support for chapter 1 and chapters 2 through 10 contain the technical support for chapter 11. The appendixes [1] contain the supporting data and exposition of some of the techniques used in these more technical chapters.

There are three other reports in preparation which utilize this same data base (i.e., the Educational Opportunities Survey data). Two of these reports focus on the student while the other one focuses on the teacher.

The major differences between this report and an earlier report that used this data base (Coleman et al., 1966) are:

1. The school is the unit of analysis in this report whereas in the earlier report the unit of analysis was the student. As a consequence of this design, possible within-school and "student body" influences are not dealt with as they were in the 1966 report. They will, however, be treated in a later report in this series.

2. In this report, analyses were carried out for the entire country and racial-ethnic group membership has been included as a variable. In the earlier study, however, racial-ethnic and regional groupings of students were kept separate. A later report in this series deals extensively with separate groupings of students by racial-ethnic group membership, region of the country, and rural-urban background.

3. A number of the variables used in this analysis differed from those used in the earlier analysis. Several of the variables also differed.

4. Results are presented here in terms of commonalities and unique variance explained. In the earlier study they were reported in terms of unique or added variance explained at different points in the analysis.

[1] Under separate cover, and available on request from the senior author.

This report represents the culmination of a team effort in which each of the authors contributed according to his specialized interests and background. Albert E. Beaton designed the systematic approach for data processing and developed the necessary computer programs. He also devised the criterion-scaling technique. Frederic D. Weinfeld was instrumental in getting the study started, and worked closely with the senior author in scaling the variables and developing the indices. Carl E. Wisler, with an initial assist from Alexander M. Mood, performed most of the developmental work on the commonality model. He also conducted the quasi-longitudinal aspect of the study and assisted in reviewing the early drafts of this report. Kenneth A. Tabler provided assistance in those phases of data analysis concerned with the development of scaling procedures and indices. As an Office of Education fellow, John M. Proshek performed extensive stratification analyses, only a small fraction of which appear in this report. A monumental share of the data processing and analysis was performed by Wallace M. Cohen and Tetsuo Okada. The senior author is solely responsible for the techniques used, the content of the study, and its presentation.

The labors of this team, however, could not have reached fruition without the initial impetus given to the work by Alexander M. Mood, when he was Assistant Commissioner for Educational Statistics, and the later support of the work by Joseph N. Froomkin, when the staff was transferred to his authority as Assistant Commissioner for Program Planning and Evaluation. To them this work is most heavily indebted. David S. Stoller and Harry Piccariello provided valuable guidance and commentaries at various stages of the work. This report has benefited greatly from the thoughtful review and constructive comments of Alexander M. Mood, James S. Coleman, and William G. Cochran. The organization and style of this report were improved through the editorial efforts of John M.B. Edwards. Pat Dever helped fulfill many of the administrative requirements associated with an undertaking of this magnitude. Shirley Stevens has worked diligently for the past 2 years in the typing of myriad interim technical reports as well as the basic manuscript for this report, while Kathy Crossley prepared the extensive tables of correlations. After the final editing had been performed, Patricia Edwards retyped chapters 1 through 11, except for the tables. Many of the latter were retyped by Louise Powell, Delores Williams, Maryann Nelson, Phyllis Stone, Frances Levine, and Marilyn Miller. The authors are also grateful for the continuing interest shown in their work by their numerous colleagues. Without the efforts of all these people this report would not have been possible.

GEORGE W. MAYESKE

May 1969 [2]

[2] This report was first issued as a working paper in January 1970.

Abstract

The purpose of this study was to discover what characteristics of the Nation's schools are most closely related to school outcomes. This involved devising methods by which school influence could be distinguished from social background influence.

The study was conducted by the Office of Program Planning and Evaluation of the U.S. Office of Education, Department of Health, Education, and Welfare. Data came from a survey commissioned by Congress in the Civil Rights Act of 1964 and carried out the following year. The population sampled consisted of the students, teachers, principals, and superintendents of the Nation's public elementary and secondary schools.

A 5-percent stratified cluster sample was used. About 650,000 students from about 4,000 schools, with their teachers, principals and superintendents, were included in the study. Since the purposes of the survey were to determine the educational opportunities of minority groups, strata with higher percentages of nonwhites and other minority group members were sampled more heavily. As a result, over 40 percent of the 650,000 students were from minority groups. For reasons of time and economy, and because little essential information would have been added anyway, only students in grades one, three, six, nine, and 12 were considered. Separate tests and questionnaires were administered to each of these grades, as well as to the teachers, principals, and superintendents. A preliminary analysis of these data has already been published in the report "Equality of Educational Opportunity," to which the present report is intended as a sequel.

In the present study, which is the first of a series, the unit of analysis was the school. The process of data analysis began with the reduction of the approximately 400 questionnaire items to between 60 and 70 items. This was done by grouping related items according to their meaningfulness into indices. The indices so produced were in turn divided into three groups: student's social background, school's characteristics, and school outcomes. No subsets of students within a school were distinguished because the main interest in the present study was in the school's effect on all its students. The 31 indices making up the second group were subdivided into three additional groups: facilities, pupil programs and policies, and school personnel and personnel expenditures. Finally, two main kinds of school outcomes were distinguished: student's attitudes and motivations, and student's achievement.

The statistical techniques employed in pursuing the main questions were regression analysis and partition of multiple correlation. In this way it was possible to determine the percent of school outcomes associated with the distinguishable influence of school's characteristics, the percent associated with the distinguishable influence of student's social background, and the percent that was common to these two groups.

The principal findings were as follows. On the whole, the influence of the school cannot be separated from that of the student's social background—and vice versa. Moreover, the common influence of the school and the student's social background exceeds either of their distinguishable influences. Schools exert a greater influence, in terms of both attitude and achievement, on students who have relatively high socioeconomic status, are either white or Oriental-American, and come from homes where both parents are still living together. In this process, a school's physical facilities seem unimportant compared with its personnel. Of its personnel's characteristics, the most important seems to be experience of racially imbalanced educational settings—e.g., being educated and teaching in virtually all-white or all-nonwhite institutions.

Schools that score high on one outcome, such as achievement or the desire to stay in school, tend to score high on the others. Most of these outcomes become increasingly related to the 31 school indices the longer the student stays in school. Even though students may start at the same level of achievement, the longer they stay in school the more easily their achievement gains can be predicted from the common influence of their school with their social background. In fact, it appears that the influence of the schools is bound up with the student's prior experiences. Up to the 12th grade, the distinguishable influence of social background is greater than that of the school. At the 12th grade, however, social background influence is less than school influence for motivational and attitudinal outcomes. But it remains greater for outcomes pertaining to achievement.

In conclusion, it may be stated that the overwhelming impression received from these data is that schools are indeed important. It is equally clear, however, that their influence is bound up with that of the student's social background. In such a situation, survey research is of only limited use. More experimental studies are needed, especially of educational innovations. Among such innovations should be included the periodic monitoring of school systems, the establishment of explicit performance criteria by which to monitor them, and the attainment of educational institutions that are more balanced in the socioeconomic and racial-ethnic composition of their students.

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1. What the Report Is About

This chapter presents a brief nontechnical summary of the report. A series of questions and answers is used to bring out the main points.

1.1. WHAT QUESTION DID THIS STUDY SEEK TO ANSWER?

This study attempted to find out what it was about our Nation's public schools that makes some better than others.

In order to find out what makes for a good school we had to be a little more specific about what we meant by "good" in such a context. A school in our society is expected to provide its students with information and skills —knowledge of American history, for example, or facility in performing certain arithmetical operations. It is also expected to teach a student to get along with other children who are different from himself, to help him discover the nature of his own abilities, and in general to prepare him for adulthood and the duties of a citizen. All of these different things a school is expected to accomplish we can call *outcomes* of the school, and we can judge a school good or bad in terms of its outcomes.

Schools may also differ in their *resources*; i.e., the staff and facilities they can bring to bear in influencing their outcomes. For example, some schools can give more attention to their students' learning needs because they have more teachers and teacher aides per student. Schools differ, too, in the kinds of students that they get. Some schools have a large number of students who, upon entering school, already possess knowledge, skills, and motivation that a large number of students entering other schools do not possess. Many of these differences are attributable to family influences. Some families have more resources than others and spend more time in different activities with their children. Their children accordingly develop various skills and a readiness to learn. Such family practices vary with the socioeconomic background of the student as well as with his racial and ethnic background. We therefore refer to differences from this source as differences in the student's *social background.*

We can now reformulate our original question. Instead of "What makes for a good school?" we propose to ask: "After taking into account the social background of a school's students, what characteristics of the schools are most effective in influencing school *outcomes*?"

1.2. WHAT SOURCE OF INFORMATION WAS USED?

Our source was a survey of the Nation's public elementary and secondary schools conducted in the fall of 1965 by the U.S. Office of Education at the direction of Congress. The survey entailed the testing and surveying of about 650,000 students,[1] together with their teachers, principals, and superintendents, in some 4,000 public schools throughout the country. The survey sample consisted of a 5-percent sample of schools. Detailed information, both objective and attitudinal, was collected on the student's home background and his attitudes toward school, race relations, and life in general. A battery of ability and achievement tests was administered at each of the five grade levels. Information was collected from the teachers and principals concerning their training and experience, their views of the school, and many other topics. The final part of the teacher questionnaire consisted of a short vocabulary test which was intended to be a measure of the teacher's verbal skills. In addition, the principal provided data on the school's facilities, staff programs, curriculums, etc. This study utilized the information from this survey (called the Equality of Educational Opportunities Survey) to explore school influences.

1.3. HOW WERE THE DATA ANALYZED?

There were approximately 400 items of information available on the students, teachers, principals, and schools. This was obviously too much information to analyze or even to comprehend in its raw state. Consequently, a program of analysis was undertaken to reduce these 400 items into a more manageable number by grouping items related to one another. For example, we developed an index of the special staff and services a school offered by grouping the number of art, music, speech, and remedial reading teachers it had together with the number of guidance counselors, librarians, and nurses and a measure of its provisions for handling mental health problems. This program of analysis reduced the number of items from 400 to a more manageable number between 60 and 70. The reduced items were then used in later analyses.

Three main divisions of the reduced items were used in the main body of the analysis. The first division contained items that pertained to student's *social background.* These included parents' educational level, father's occupation, number of parents in the home, and whether they were predominantly white, Puerto Rican, Mexican-American, Indian-American, Oriental-American, or Negro. The second division contained items that pertained to *school's characteristics.* These included school's facilities and school personnel's training, experience, kind of college attended, racial and ethnic composition, average verbal skills, and average salary. The third division contained items that pertained to *school outcomes.* The items

[1] Only students in grades 1, 3, 6, 9, and 12 were included in the survey.

here could be classified into two main types. There were those that referred to *students' attitudes and motivations*. These included the proportion of students who planned to stay in school or pursue more education after they had graduated, the expectations they felt their parents and teachers held for their academic performance, what they believed an education would help them attain, and several related measures. There were also those that referred to *student's achievement*. These included both skills he had acquired and things he had learned in traditional academic areas.

A large number of statistical analyses were performed, interrelating items from these three main divisions. The primary statistical tools used were regression analysis and partition of multiple correlation. As a result, we were able to distinguish between:

(i) Percent of school outcome associated with the distinguishable influence of the school's characteristics;

(ii) Percent of school outcome associated with the distinguishable influence of the student's social background; and

(iii) Percent of school outcome that could just as well be associated with either one.

1.4. WHAT KINDS OF ANSWERS WERE OBTAINED?

The results of our analyses can be grouped into three main bodies of findings:

(1) Very little influence of the schools can be separated from the influence of their students' social backgrounds. Conversely, very little of the influence of the students' social background can be separated from the influence of the schools. The schools, as they are currently constituted, produce more learning and foster greater motivation in students who:

(i) Come from the higher socioeconomic strata rather than from the lower socioeconomic strata;

(ii) Have both parents in the home rather than only one or neither parent in the home;

(iii) Are white or Oriental-American rather than Mexican-American, Indian-American, Puerto Rican, or Negro.

(2) Until the 12th grade, the part of the influence of the student's social background that can be separated out is usually larger than the part of the school's influence that can be separated out. At the 12th grade, however, the distinguishable influence of the school is greater than the distinguishable influence of the student's social background for most of the motivational and attitudinal outcomes. The opposite is true for achievement at the 12th grade.

(3) For the attitudinal and motivational outcomes the common influence of the school's characteristics and the student's social background differ for the different grade levels. But for achievement the school's characteristics and the student's social background have a common influence that is much larger than their distinguishable influences, and that increases the longer the students stay in school.

Figure 1.1 illustrates the meaning of some of these conclusions in diagrammatic form.[2] The figure refers to influences on study habits at the ninth grade. The different segments of the circles represent the proportion of study habits and achievement that can be associated with the influences, both distinguishable and common, that we have been discussing. The variable we have called Study Habits refers to how many hours a day the student studies, how often he talks with his parents about his school work, and related measures. It will be seen that the distinguishable influence of the student's social background, $U(B)$, is by far the greatest influence on study habits. For Achievement, which refers to the student's reading and mathematics skills as well as his general knowledge, $U(B)$ is still greater than the distinguishable influence of the school characteristics, $U(S)$, but the common influence of these two sets of variables, $C(BS)$, is dramatically greater than their distinguishable influences.

(4) Schools that perform well on one outcome tend also to perform well on other outcomes. These performances tend to facilitate and reinforce one another. For the attitudinal and motivational outcomes a school's generalized favorable performance has a large distinguishable influence. It also has a common influence with the student's social background. For the achievement variable the influence of a generalized favorable performance is manifested in common with the school's characteristics and the student's social background.

Figure 1.2 gives a diagrammatic illustration of these results for study habits and achievement at the ninth grade.[3] The figure shows that the other school outcomes have the largest distinguishable influence on study habits, but that the largest influences of all are due to the common roles of the student's social background with the other school outcomes *and* the school characteristics, $C(BSO)$. The same is true of achievement.

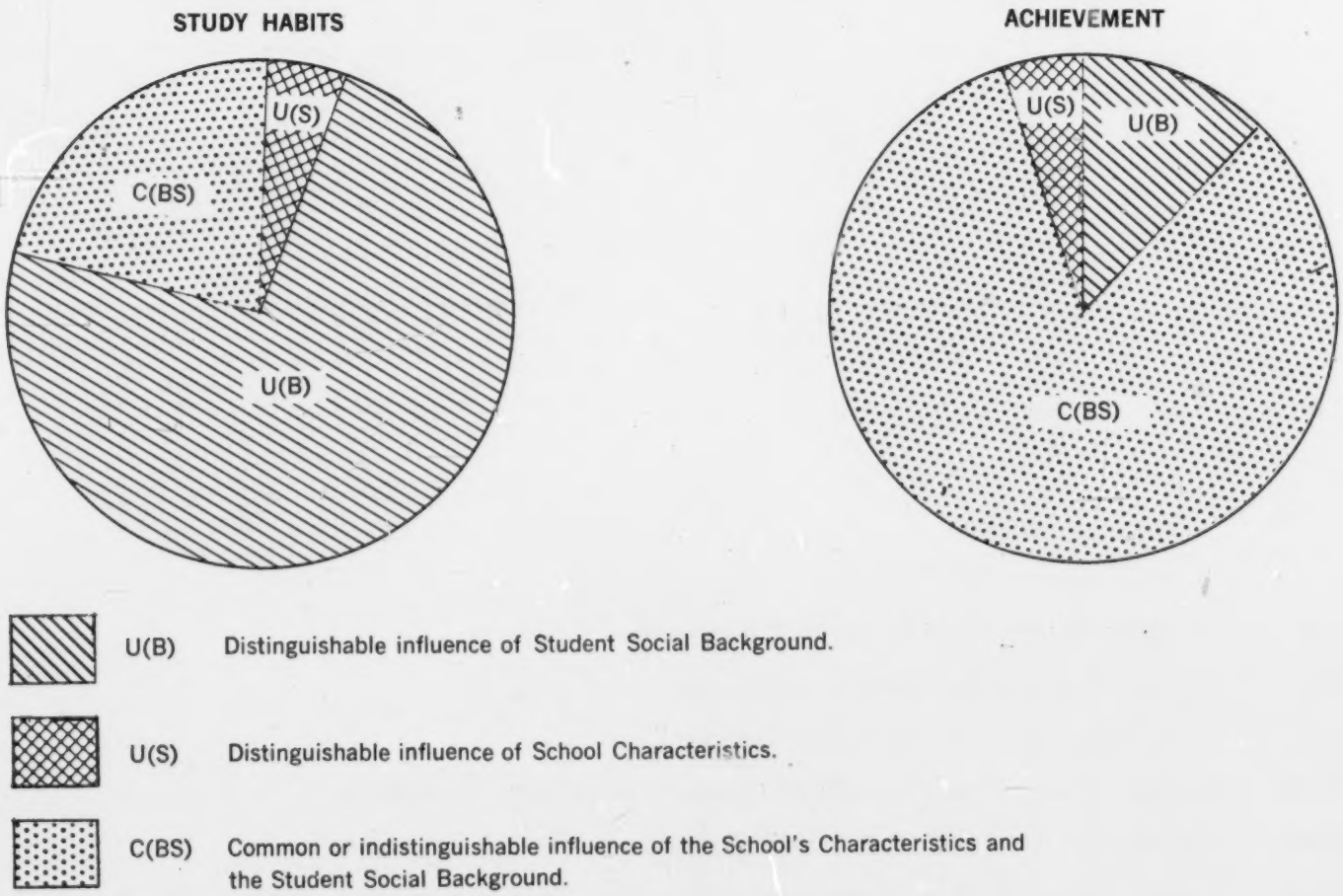
(5) The school variables that are most heavily involved in school outcomes are those concerned with actual characteristics of the school's personnel, as distinguished from the school's physical facilities and pupil programs and policies, or even from school personnel expenditures such as teaching salaries.

(6) Chief among teacher's characteristics related to school outcomes were those reflecting experience in racially imbalanced educational settings. Most nonwhite teachers had attended predominantly nonwhite educational institutions and were teaching predominantly nonwhite students. Nonwhite educational settings, it was

[2] The pie charts are obtained by dividing the commonality coefficients from table 5.3.2.1 by the squared multiple correlations for both sets of variables and drawing these numbers as relative proportions of a circle.

[3] The pie charts are obtained by dividing the commonality coefficients from tables 9.3.6 and 9.3.7 by the squared multiple correlations for all three sets of variables and drawing these numbers as relative proportions of a circle.

Figure 1.1.—Diagrammatic Representation of the Distinguishable and Common or Indistinguishable Influences of the School's Characteristics and the Student's Social Background on Study Habits and Achievement at the 9th Grade



suggested, tend to have associated with them lower levels of achievement and motivation, as well as less favorable socioeconomic and family conditions. The result is less adequate preparation than that received in predominantly white institutions.

1.5. TO WHAT EXTENT DO WE ALREADY KNOW THESE THINGS?

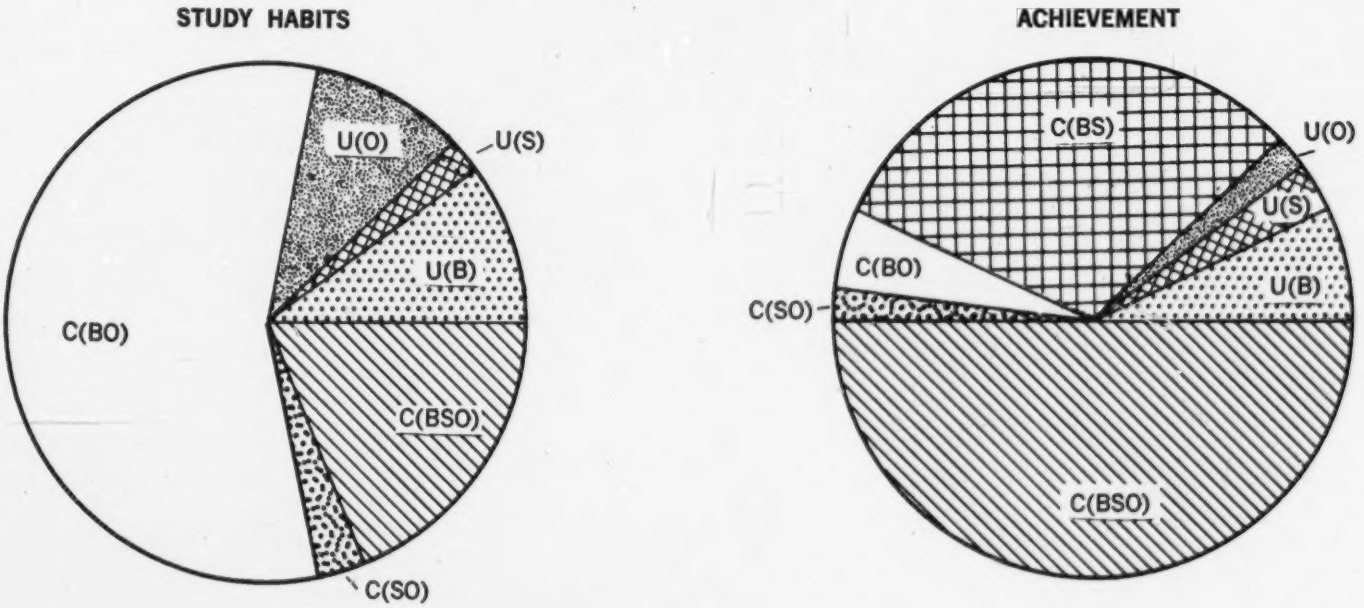
Many of these results coincide with everyday experience. They also coincide with results obtained by other investigators working with more limited samples of students and schools. The unique feature of this study is that it documents the extent and magnitude of these relationships with a national sample for the first time. It is therefore the first survey that enables one to gauge the full scope of the problems confronting the American educational system.

1.6. WHAT NEEDS TO BE DONE?

Our analyses have shown that it is very difficult to distinguish between the influence of the student's social background and the influence of school. This makes it difficult if not impossible to tell in any *specific* way how much of a change can be produced in certain school outcomes by systematically altering school characteristics such as the amount and kind of training received by teachers. In our opinion, specific answers to questions concerned with the improvement of school outcomes can be obtained only from situations governed by an appropriate degree of experimental control. To find out what will improve the schools we need to try a variety of very different kinds of innovations. Some of them might include providing parents with a choice of school systems that their children can attend. Others might involve greater parental control over the educational process or more individualized programs of instruction. All will have to be systematically evaluated and compared.

Even if an innovation has proved its worth, simply installing it, we believe, is not enough. A school's performance, like that of any complex organization, can fluctuate over time. It, therefore, requires periodic monitoring in the light of its objectives. But what are those objectives? If a school is not managed in terms of explicit performance criteria, then it will be impossible for its clientele—school board members, parents, all those who act in behalf of our society's children and adolescents—to tell with certainty whether it is performing well or badly. Accordingly, we feel that such criteria and such monitoring should be instituted.

Figure 1.2.—Diagrammatic Representation of the Distinguishable and Common Influences of the School Characteristics, Student Social Background, and Other School Outcomes



U(B)	Distinguishable influence of Student Social Background.
U(S)	Distinguishable influence of School Characteristics.
U(O)	Distinguishable influence of Other School Outcomes.
C(BS)	Common influence of the Student Social Background and School Characteristics.
C(BO)	Common influence of the Student Social Background and Other School Outcomes.
C(SO)	Common influence of the School Characteristics and Other School Outcomes.
C(BSO)	Common influence of the Student Social Background, School Characteristics, and Other School Outcomes.

In conclusion, let us quote from the last chapter of this report:

> How can a society that is committed to equality for all, in all aspects of its life, expect to achieve that equality when its educational enterprise not only reflects but perpetuates an inequitable social structure? Our analyses have suggested that the extraordinary aggregation of students into schools on the basis of their race, ethnicity, and socioeconomic background precludes the attainment of an open society. Indeed, if the dependence of the schools on the social background of their students could be lessened (viz, if student bodies were more balanced or better mixed in terms of their social backgrounds) then, in the language of our analysis, educational kinds of variables might make a greater relative contribution to students' achievement levels and motivation.[4]

[4] See chapter 11, page 113.

SUMMARY

There are three major areas that the writers believe hold promise for improving the American public schools. These are: (1) the trial of new programs and approaches in situations so structured that the results of the innovation can be clearly ascertained; (2) the incorporation of successful innovations as operational programs in a school management system that periodically monitors all ongoing programs against specified objectives; and (3) the promotion of greater socioeconomic and racial balance in the schools (as well as in housing and employment), so that the opportunity structure of American society can be more accessible to all its members.

2. Objectives and Study Design

2.1. THE EQUALITY OF EDUCATIONAL OPPORTUNITY SURVEY

Title IV of the Civil Rights Act of 1964 required the Commissioner of Education to "conduct a survey and make a report to the President and the Congress, within two years of the enactment of this title, concerning the lack of availability of equal educational opportunities for individuals by reason of race, color, religion, or national

origin in public educational institutions at all levels in the United States, its territories and possessions, and the District of Columbia."

In response to this request the Educational Opportunities Survey (EOS) was carried out by the National Center for Educational Statistics of the U.S. Office of Education, directed by Alexander M. Mood.[1] In addition to its own staff, the center used the services of outside consultants and contractors. James S. Coleman of Johns Hopkins University had major responsibility for the design, administration, and analysis of the survey. Ernest Q. Campbell of Vanderbilt University shared this responsibility and, in the case of the college surveys, assumed the greater share of it. Frederic D. Weinfeld served as project officer for the survey.

The survey addressed itself to four major questions:

(1) To what extent are the racial and ethnic groups segregated from one another in the public schools?

(2) Do the schools offer equal educational opportunities in other respects?

(3) How much can students be said to learn, judged by their performance on standardized achievement tests?

(4) What kinds of relationships may be supposed to exist between a student's achievement and the kind of school he attends?

Work was started on the survey in the spring of 1965 with a view to administering the questionnaire and tests that fall. Approximately 70 percent of the schools that were requested to participate in the study actually did so. This entailed testing and surveying some 650,000 students in approximately 4,000 schools throughout the country in grades 1, 3, 6, 9, and 12, together with their teachers, principals, and superintendents.

On the basis of competitive bids, the Educational Testing Service of Princeton, N.J., was awarded the contract for conducting the Educational Opportunity Survey, including test administration, test scoring, data processing, and data analysis. They also consulted on various aspects of the survey and convened an advisory panel to aid in its design and analysis.

The survey used a 5-percent sample of schools. This was a two-stage, self-weighting, stratified cluster sample. The primary sampling units (PSU's) in the first stage were counties and standard metropolitan statistical areas (SMSA's). The PSU's in the second stage were high schools. When one was drawn in the sample the elementary schools feeding into that school were automatically included in the sample as well. Since the Educational Opportunities Survey was primarily concerned with the children of minority groups, and since these groups constituted only about 10 percent of the total school population, the schools were stratified according to their percentage of nonwhite students. Strata with higher percentages of these students were given larger sampling ratios and thus were sampled more heavily. The final result was that over 40 percent of the students in the survey were from minority groups.

[1] Author of the foreword to this report.

Separate questionnaires were administered to teachers, principals, superintendents, and students at each of the grade levels studied. The teacher questionnaire contained some 72 questions including: Personal data, professional training, type of college attended, teaching experience, type of school and student preferred, job satisfaction, opinions on issues and problems of integration (busing, compensatory education, etc.), and problems existing in their school.

The final part of the teacher questionnaire consisted of a voluntary test of 30 contextual vocabulary items. The purpose of this test was to get a measure of the teachers' verbal facility.

The 100-item principal questionnaire was the main source of information about the school. The questions covered school facilities, staff, programs, racial composition, programs, curriculums, extracurricular activities, and many other school characteristics. There were also questions on the personal background and training of the principal and his opinions on the problems of integration.

The superintendent questionnaire consisted of 41 questions. In addition to miscellaneous administrative information about the school system, including its expenditures, the questions dealt with the superintendent himself and his attitudes toward current educational issues.

Detailed factual and attitudinal data about the students were also obtained by questionnaire. Included were items of home background information so that these data could later be equated for such items as socioeconomic status, family background, family interest in education, etc.

Different questionnaires were used for each of the grade levels. The 12th-grade student questionnaire for example, was comprised of some 116 items. In addition to the questions on home background and the usual personal and school data there were questions on the students' attitude toward school, race relations, and life in general. Representative examples of each category are: "How good a student do you want to be in school?" "If you could be in the school you wanted, how many of the students would you want to be white?" "Good luck is more important than hard work for success (agree or disagree)."

Tests of the various school skills were to be the yardsticks for measuring the detrimental effects of poor school facilities and characteristics upon student learning. The test battery was designed as an integral part of the entire research design. The object was to obtain as much data as possible within the limitations of time and available resources. Two of the basic skills chosen were reading comprehension and mathematics ability. These two areas are common to all school curriculums and all grade levels. Another area deemed important was that of the general level of knowledge gained by the students, either from their school courses or from experiences in the outside world. A test of general information was therefore included in the test battery. Two other ability tests were used to measure the students' verbal and ratiocinative skills.

One major limitation on the design of the test battery was the time required for test administration. It was considered both desirable and administratively feasible to have the test battery and the questionnaires completed in no more than one school day. The lower grades had to have a shorter battery because of the limited attention span of the younger children. Therefore, the testing time increased in the various test batteries until it reached its maximum length in the 12th grade.

The lead time before the administration of the survey in September 1965 was too short to develop specific tests in the above areas. For this reason, existing standardized tests were used. However, because full-length standardized tests usually require more time than would have been available, it was decided to use shortened, or half-length, forms of these tests rather than to omit tests in any area. Another administrative requirement was that the various tests be interlocked through as many grades as possible so that scores on the same type of tests given at different grade levels could be compared. The scaling allowed us to have a comparable measure of growth between the different grades.

The act required that the survey be made at "all levels." It was therefore decided to administer the tests to selected grades at spaced intervals. The expectation was that this would give a good picture of what was going on in the schools while avoiding the need to test at every grade level. The grades chosen were 1, 3, 6, 9 and 12.

Following this survey a report entitled the *Equality of Educational Opportunity* was submitted to the President and the Congress on July 2, 1966, under the principal authorship of James S. Coleman. This report has become known as "The Coleman Report;" the reader is referred to it for further details of the study (Coleman et al., 1966).

2.2. ANALYZING DIFFERENCES AMONG SCHOOLS

The present study is based upon the assumption that at least some of the differences that exist between public schools in the United States are related in a causal manner to the attitudes and achievement levels of their students. The objectives of the study, then, are twofold: to find characteristics of the schools that seem to be related to school outcomes, and to suggest what aspects of the schools might be most important in producing these outcomes.

The number of responsibilities that schools are expected to fulfill for their students is on the increase. Reading skills, manipulation of mathematical symbols, knowledge in areas as diverse as history and hygiene—all these fall within the province of the schools. They also have a part to play in developing their students' desire for learning, ability to get along with others, ambition to succeed, and even general philosophy of life. All of these outcomes the schools influence to a degree that varies according to the kinds of students they receive and the staff and facilities at their command.

Students with different family backgrounds enter school and progress through it with different conceptions of how education will satisfy their present and future needs. Why do some schools influence these conceptions more than others? Is it the teacher's training and experience, the number of pupils per teacher, or something about the instructional facilities? How much of a role does each of these play?

Many of the differences that exist between schools exist also within a single school. This study, however, will delve only into those differences that exist between schools. A later study in this same series will explore differences within schools.

In analyzing school characteristics that are related to school outcomes one has to take into account the characteristics of entering students, since these may also be related to school outcomes. The difficulty with this approach is that both the characteristics of the schools and their influence on the students may be so highly related to the characteristics of the entering students that after these are taken into account there may be very little that can be attributed to the independent influence of the school. We shall see later that this problem does arise and that techniques were developed for coping with it—though not, unfortunately, for overcoming it, at least with the kind of information used here.

School outcomes can be studied with the help of several different kinds of information or data. Each kind can be thought of being located somewhere on one of the following two continua:

(1) *Cross-sectional versus longitudinal data.*—*Cross-sectional* data are collected at one point in time. For example, achievement tests and family background questionnaires can be administered to students on the same day, and then the achievement test results can be related to the questionnaire results. *Longitudinal* data are collected at two or more different points in time, but from the same individuals. Thus, achievement test data can be collected from students immediately before and after their participation in a course of study, and then compared.

(2) *Experimental versus associational data.*—An experimental situation is one that is so controlled or structured as to yield answers to a particular set of questions. A simple example of data obtained from an experimental situation would be the scores on a reading comprehension test obtained from students randomly assigned to one of a number of classes where different techniques of teaching reading were being tried out. Associational data are statistically manipulated to equate for conditions not amenable to experimental control. Thus if the students in the above example could not be assigned randomly to the different classes, but if a measure were available of their ability before they entered the course, their post-course reading scores might be adjusted to offset individual differences. In this way it might be possible to obtain a reliable estimate of the course's effectiveness. If, however, the kind of reading class they enroll in is very highly related to their initial ability, then there may be very little improvement in reading comprehension that could be attributed to the different techniques of teaching

reading. Accordingly, knowledge of individual differences would not help very much.

All these different kinds of data have their advantages and disadvantages. Choice of one kind over another must depend on the research situation. Thus, associational data are often easier and cheaper to obtain than experimental data. But if the control or equating variables are highly correlated, then associational data may not yield any definitive answers. On the other hand, experimental conditions are often difficult to maintain, especially in large-scale studies, because of the large number of uncontrolled variables. Similarly, longitudinal data are usually both more difficult to obtain, because of the attrition of subjects during the course of the study, and more expensive because of the repeated testing that is required. Cross-sectional data are usually easier and cheaper to obtain than longitudinal data, but may not readily support inferences concerning the nature of changes over time. In short, for any given study an investigator must often compromise between what is desirable and what is achievable.

For the study of school influences on student achievement it would be highly desirable to obtain longitudinal data on many schools and their students, and to have some of the schools participate in experimental situations while others operate more routinely. Such data would be costly and difficult to obtain They would be worth obtaining, however, because nothing of the kind is currently available on a national scale. The fact that many States are currently developing such data points to their usefulness.

The analyses presented in this report are based upon cross sectional-associational data. That is to say, schools were sampled at one point in time, while information on family background, together with achievement test data, was collected from different students at different grade levels. We then attempted to determine what were the influences associated with the students' attitudes and achievement levels. A brief description of the study design, manner of sampling, and instruments used is given in the following section.

2.3. DESIGN AND ANALYSIS

The main objective of this study was to analyze the data obtained from the EOS, using the school as the unit of analysis. In this way we hoped to learn what differences among schools are related to school outcomes, and how both are related to the socioeconomic background and racial-ethnic group membership of the students. Within this context, two major questions offered themselves for solution:

(1) How do the schools' characteristics influence such things as the achievement level of *all* the students in school?

(2) How do the schools' characteristics relate to the *various* achievement levels of the different kinds of students they get?

This study focuses primarily on the influence of the schools on all of the students in the school.[2] In order to do so, it had first to deal with the following technical problems:

(i) How could discrete categorical variables such as "Father's Occupation" best be scaled so that they could be meaningfully interpreted and related to other variables of interest?

(ii) How could provision be made for nonlinear or curvilinear relationships that might otherwise be obscured in the data?

(iii) How could estimates be made of missing data, particularly when those students who failed to provide an answer to a question were of great interest to the analysis?

(iv) How could the more than 400 variables be reduced so that the task of data processing and analysis could be made less complex?

To perform the kind of analysis we wanted and at the same time resolve the above problems the following logical steps were evolved and translated into the necessary computer programs:

Item analyses.—Each questionnaire item was analyzed against one or more variables of interest. In this way not only the percent of respondents choosing each item but also their average score on the variable(s) of interest could be used as a guide in assigning code or scale values for each alternative. The same was true for the nonrespondents. For the students, questionnaire item responses were analyzed against an achievement composite.[3] For the teachers, questionnaire item responses were analyzed against the number of items that were correct on the teacher's vocabulary test.[4] Questionnaire item responses for the principal's questionnaire were analyzed against the principal's response to questions concerned with his annual salary, number of students enrolled in the school, the rural-suburban-urban location of the school and the proportion of children in the school from working class families.[5]

Coding and intercorrelation of variables.—An approximate 10-percent sample of students was drawn from the student master tapes at each grade level. The variables were then coded and intercorrelated. For the teachers and principals a breakdown into elementary and secondary was made and correlations were computed for each breakdown. The full number of teachers and principals included in the survey were used in these analyses.

Reduction of variables into indices.—The intercorrelation matrices for the above steps were subjected to a series of factor analyses in order to obtain meaningful groupings of the variables, called indices.

Computation of index scores.—The weights obtained from the factor analyses were used to compute index scores first by standardizing each variable to a mean of zero and a standard deviation of one, and then by multiplying each variable by its respective weight and finally summing these values. In this step index scores

[2] A later study in this series will focus on the influence of the schools on different subsets of students within the school.

[3] See Mayeske et al., Technical Note No. 64, in the List of References, p. 115.

[4] Ibid., Technical Note No. 32, p. 114.

[5] Ibid., Technical Note No. 32, p. 114.

were computed for all of the students included in the Survey. Index means, standard deviations and intercorrelations were also computed.

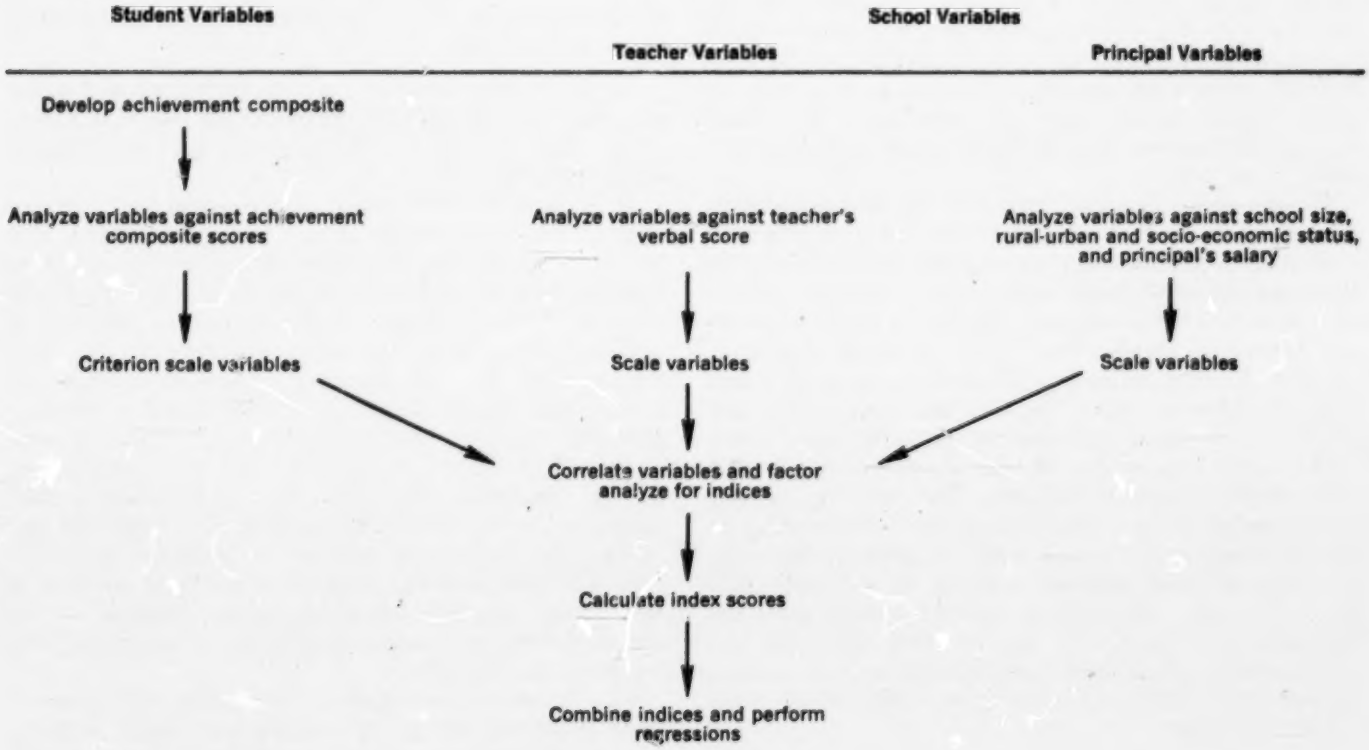
Computation of school averages.—The mean score for each school was computed for both students and teachers on the indices and variables that were carried along separately.

Merging of school data.—The school means for students and teachers were merged with the school data for principals on a single tape (one tape for each of the five grade levels).

Computation of correlations and regressions.—Correlations and regressions for each grade level were computed at this stage.

Table 2.3.1 gives a brief schematic summary of these various steps; some of them are described in detail in later chapters. Since the superintendent questionnaires could not give information about individual schools they were not used in the analyses.

Table 2.3.1.—Sequence of Steps Entailed in Data Analysis and Reduction


Student Variables
School Variables
Teacher Variables
Principal Variables
Develop achievement composite
Analyze variables against achievement composite scores
Analyze variables against teacher's verbal score
Analyze variables against school size, rural-urban and socio-economic status, and principal's salary
Criterion scale variables
Scale variables
Scale variables
Correlate variables and factor analyze for indices
Calculate index scores
Combine indices and perform regressions

3. Developing the Indices

3.1. METHODOLOGY

Our main goal in developing the indices was to reduce the more than 400 variables for easier data processing and analysis. But this had to be done in an empirically meaningful way. We therefore sought out groups of variables that not only correlated substantially with one another but were also psychologically or sociologically meaningful.

Earlier experience with the same data had shown that many of the variables were correlated to such an extent that when they were entered into a regression analysis, the contribution of a particular variable to a particular school outcome was microscopically small. For example, if values such as having a large library and having good facilities for science were kept separate in the analysis, the contribution of each separately might appear rather small just because these two variables are in fact correlated. It was hoped that by grouping similar kinds of correlated variables into indices we would make it easier to discern the contribution of each *kind* of variable to school outcomes. Another advantage of this procedure was that it reduced the sheer magnitude of regressions to be run.

The method adopted was to subject the intercorrelations of questions from the student, teacher and principal questionnaires to Principal Components analyses and Varimax rotations. These techniques are part of a broad family of techniques generally known as factor analysis (see Horst, 1965, in the List of References). The Principal Component technique extracts the roots and associated components in descending order of magnitude: the first

root is the largest, the second root the next largest, etc. Components with a root of one or greater [1] were subjected to a Varimax rotation (see Kaiser, 1958). This is a technique for rotating the components into a position that may be meaningful. It attempts to maximize the high and low weights (or coefficients) for a component so that the variables that have high weights on this component can be thought of as belonging together. In this way, an interpretative label can be applied to what they have in common.

In order to insure that the groupings of variables were meaningful a large number of subsets were subjected, one at a time, to Principal Components analyses and Varimax rotations. This approach was essentially iterative; i.e., variables that did not form meaningful groupings or blurred an otherwise meaningful grouping were eliminated, and the remaining variables reanalyzed.

The following sections describe the application of these techniques to the student, teacher and principal questionnaires.

3.2. DEVELOPMENT OF THE ACHIEVEMENT COMPOSITE

One of our more important objectives in this study was to see in what manner responses to the different alternatives for a question related to one or more variables of interest. In this way we hoped to uncover nonlinear relationships of the responses with the variable of interest. We also hoped to determine a value to be assigned to those students who failed to answer the question. With these purposes in mind a single composite measure of Achievement was developed from the tests that were administered as part of the survey. A detailed description of these tests, with examples of test items is given in the earlier report (Coleman et al., 1966, p. 575). Table 3.2.1 shows the overall procedure; it will be noted that more tests were administered at the higher than at the lower grade levels.

Intercorrelations of the tests for the different grade levels are given in table 3.2.2.[2] It will be seen that they are in the moderate-to-high range (50 to 80) for the ninth and 12th grades, and in the low-to-high range (30 to 80) for the sixth and third grades. They also appear high enough to suggest that, to a large extent, they were measuring a common attribute. In order to test whether they were we employed a principal components analysis, which is a method that aims to express what is common to a set of variables by means of a smaller number of more basic components (Horst, 1965). If a strong first principal component was found among the intercorrelations of these tests, then each student's scores on the tests could be weighted by their principal component weights and then summed. In this way a single index of achievement was created. Table 3.2.3 gives the weights for these first principal components at each grade level, with the percent of variance accounted for by each component. The latter is computed with the help of a theorem stating that the trace of a matrix (i.e., the sum of its diagonal elements) is equal to the sum of its roots (i.e., the total variance of the matrix). Since there are ones in the diagonal of the correlation matrix, the trace is equal to the number of variables. Consequently, dividing the amount of variance for each component by the number of variables, one obtains the proportion of total variance attributable to a principal component. Table 3.2.3 shows that the first principal component for grades 12, nine, and six account for about 75 percent of the total variance at each grade level. Since this is a relatively large percent for this kind of data, it indicates that a single index of achievement can be used. The weights used to obtain this index were the principal component weights in table 3.2.3 (with the exception of the first grade, where unit weights were used).

Analyses were also conducted for different regional and racial groups. Comparison of results showed that the weights were highly similar, and consequently that a single set of weights for each grade level would be appropriate. These analyses have been given in detail in an earlier note (Mayeske and Weinfeld, Technical Note

Table 3.2.1.—Number and Kind of Tests Administered, by Grade

Test	Grade 12	9	6	3	1
Verbal ability	X	X	X	X	X
Nonverbal ability	X	X	X	X	X
Reading comprehension	X	X	X	X	
Mathematics achievement	X	X	X	X	
General information in 5 areas (practical arts, girls; practical arts, boys; natural sciences; social studies; humanities)	X	X			

[1] There is no single agreed-upon criterion for the number of components that should be rotated. In psychometrics, the rotation of components that have a latent root of 1 or greater has gained common usage through Kaiser's demonstration (1960) that for a principal component to be internally consistent "it is necessary and sufficient that the associated eigen value (or latent root) be greater than one."

[2] Correlations and index weights in this and the following tables have been rounded to 2 decimal places and leading decimals have been omitted.

Table 3.2.2.—Intercorrelations of Achievement Tests, by Grade

Number in matrix	Test title	1	2	3	4	5
		12th/9th [1]				
1	Nonverbal ability	100	60	59	62	60
2	Verbal ability	61	100	77	69	85
3	Reading comprehension	58	80	100	65	73
4	Mathematics achievement	56	60	56	100	71
5	General information	60	81	71	62	100
		6th/3rd [2]				
1	Nonverbal ability	100	38	43	45	
2	Verbal ability	60	100	46	47	
3	Reading comprehension	59	79	100	59	
4	Mathematics achievement	59	74	73	100	
		1st [3]				
1	Nonverbal ability	100	64			
2	Verbal ability	64	100			

[1] The 12th-grade intercorrelations are below the main diagonal and the 9th grade above the main diagonal. The correlations for the 12th grade are based upon 96,409 observations and 133,136 for the 9th grade.

[2] The 6th-grade intercorrelations are below the main diagonal and the 3rd grade above the main diagonal. The correlations for the 6th grade are based upon 123,386 obstructions and 129,774 for the 3d grade.

[3] The correlations for the 1st grade are based upon 71,460 observations. All values have been rounded to 2 places of decimals and the decimal points omitted.

Table 3.2.3.—Weights for First Principal Component of Test Intercorrelations

Number in matrix	Test title	Principal component weights				
		12th	9th	6th	3rd	1st [1]
1	Nonverbal ability	78	76	79	72	91
2	Verbal ability	91	92	90	74	91
3	Reading comprehension	87	87	90	81	
4	Mathematics achievement	85	85	88	82	
5	General information	90	91			
	Percent of variance accounted for by the first principal component	74.60	74.63	75.70	59.90	82.23

[1] The weights from the 9th grade were computed on a desk calculator and consequently fewer iterations were computed than for grades 3, 6, and 12 which were calculated on a computer. With only 2 variables, the weights for the first principal component will be the same. The weights for the 1st grade are from 1 iteration (viz, the 1st centroid weights). The weights have been rounded to 2 decimal places and the decimal points have been omitted.

No. 21 in the List of References). The main gist of these analyses was that the first principal component, accounting for most of the variance among the tests, can be interpreted to be what we called "general scholastic ability or achievement." It is that attribute which is common to the tests. The composite score developed with the use of these weights similarly represents "general scholastic achievement."

3.3. DEVELOPMENT OF THE STUDENT INDICES

When the responses for a variable, such as the alternative responses chosen for a given questionnaire item, are analyzed against one or more criteria (i.e., dependent variable of interest), the resulting analysis is called a *criterion scale analysis*. All of the student questionnaire items for the different grade levels were analyzed against their respective achievement composite (see Mayeske et. al., Technical Note No. 64 in the List of References). These analyses were conducted in order to: (1) determine the number and percent of students responding to each questionnaire item alternative; (2) determine the number of students who failed to answer each question; (3) serve as a guideline in developing codes to scale the items for future analyses; (4) serve as a guideline in estimating missing data.

3.3.1. Examples of Criterion Scaling

The results of criterion scale analysis for the two questionnaire items of "Fathers Occupation" and "Number of Hours Per Day Spent Watching TV" are discussed below in order to indicate the meaning and usefulness of some of the results.

Table 3.3.1.1 presents the mean achievement composite scores, by grade, for students who knew their father's occupation. The overall mean for each grade level was set at 50 with a standard deviation of 10. It is of particular importance to note the trend of the achievement means for the "Don't know" and "Nonresponse" categories. The nonresponse means for the first and third grades are very close to the total mean of 50. In contrast, the nonresponse means for the sixth, ninth, and 12th grades are progressively lower, Thus, to use the mean scores of the respondents as a value to assign to the nonrespondents would not introduce many systematic distortions at the first and third grade, but would do so at the higher grade levels. This is because the nonrespondents at the higher grade levels differ systematically in their achievement scores from the respondents.

Table 3.3.1.1.—Average Composite Achievement Scores of Students, by Father's Occupation

Father's occupation	Means for the different grade levels				
	1st	3rd	6th	9th	12th
A. Technical	52.254	54.368	48.728	52.674	52.379
B. Official	53.613	54.481	52.766	52.299	52.653
C. Manager	53.665	54.586	53.570	53.451	52.771
D. Semiskilled	50.025	50.061	49.995	50.060	49.510
E. Salesman	53.849	53.917	54.101	53.877	53.558
F. Farm or ranch manager or owner	53.573	52.897	50.166	50.397	50.707
G. Farm worker	46.430	45.684	45.532	43.316	42.478
H. Workman or laborer	46.487	45.923	49.572	48.657	47.221
I. Professional	55.466	56.833	55.299	56.597	56.012
J. Skilled worker or foreman	51.422	50.764	51.438	51.000	50.607
K. Don't know	45.506	45.698	44.086	43.057	41.850
Nonresponse	49.031	48.787	45.002	42.599	42.338
Total	50.000	50.000	50.000	50.000	50.000

One can also note a trend for the mean of the don't know responses to become lower at grades six through 12. Students at the higher grade levels who don't know their father's occupation have lower relative achievement than students at grades one and three who don't know their father's occupation.

Table 3.3.1.2 gives the mean achievement composite scores of these 12th-, ninth-, and sixth-grade students (the question was not asked at the lower grade levels) who indicated that they spent various amounts of time watching TV. This table shows that there is a curvilinear relationship between TV watching and the achievement composite, and that the nature of this relationship alters at the different grade levels. The general trend is for the achievement levels of students who say they watch TV not at all, very little or very much to be lower than the achievement levels of students who say they watch TV an intermediate number of hours. At the sixth grade there is a slight reversal between half an hour per day and none. At the 12th grade, however, the higher achieving students spend 1½ hours per day or less watching TV while the lower achieving students say they spend upwards of 2 hours per day. For all grade levels the nonrespondents have very low-achievement levels.

Table 3.3.1.2.—Average Composite Achievement Scores of Students Indicating Number of Hours Spent Watching TV [1]

Number of hours per day	Means for the different grade levels		
	6th	9th	12th
A. None or almost none	47.087	48.262	50.670
B. About ½ hour a day	45.796	49.291	52.001
C. About 1 hour a day	50.776	52.058	51.808
D. About 1½ hours a day	52.950	52.968	51.485
E. About 2 hours a day	52.505	51.927	49.790
F. About 3 hours a day	52.234	51.348	48.803
G. Four or more hours a day	49.051	47.280	45.839
Nonresponse	41.886	39.479	41.771
Total	50.000	50.000	50.000

[1] Does not include televised instructional materials presented in school.

These analyses can be very helpful in determining what codes or scale values to use in scoring the variables. For instance, on the basis of the information in table 3.3.1.1 one could rank the occupations by their mean values, assigning a high rank to a high mean and a low rank to a low mean. These ranked values could then be used as codes or scale values. Thus, if a student indicated that his father was a "Professional" he would be assigned the highest rank, and if a student indicated that he did not know what his father's occupation was he would be assigned one of the lower ranks. However, because there is a curvilinear relationship between Number of Hours Per Day Spent Watching TV (in table 3.3.1.2) and the achievement composite, the kinds of codes or scale values that should be used are not so obvious. If one coded the different categories to reflect the increasing number of hours spent watching TV, the underlying curvilinear relationship would be obscured. This is because both high- and low-code values would have low-achievement levels associated with them, while intermediate-code values would have high-achievement levels associated with them. An alternative course would be to give the categories with high-achievement levels a high-code value and those with low-achievement levels a low-code value. This would serve to increase the relationship of the item with achievement, but at the same time it would alter the meaning somewhat. The variable or item would now be coded to show there was an optimum number of hours per day spent watching TV in relation to achievement.

When the mean of the criterion variable for each category is used as the code or scale value the variable is said to be *criterion scaled*. For example, a 12th-grade student who indicated that he spent half an hour per day watching TV would be assigned a value of 52.001 while a student who indicated that he spent 4 or more hours would be assigned a value of 45.839 (see table 3.3.1.2). This technique maximizes the linear relationship of the item or variable with the criterion variable.[3] Most of the student items were scaled using this technique.

The reader may wonder just what advantages and disadvantages accrue from using criterion-scaled variables. Criterion scaling has the desirable properties of:

(1) Providing reasonable values for the nonrespondents and "Don't Know's."

(2) Indicating the effect of using these latter values for the nonrespondents and "Don't Know's" (viz, the extent of their departure from the mean values for the other respondents).

(3) Maximizing the linear relationship of the variable or item with the criterion, and therefore increasing the stability of the linear regression model.

The possible disadvantages of using criterion scaling are that:

(1) It may distort the meaning of the item or variable so that it is not readily interpretable.

(2) It may so alter the sequence of codes or scale values of an item that one cannot extrapolate a relationship beyond the observed categories or values of that item (e.g., we cannot generalize the relationship to say that watching TV 6 hours a day will be associated with even lower achievement levels than for 4 hours a day).

However, these apparent disadvantages did not prove detrimental to the purpose in hand. Most of the relationships were linear or nearly linear,[4] and even when they were curvilinear meaningful interpretations were still possible. In addition, comparison of the results obtained at different stages in the analysis from criterion-scaled variables with results obtained from variables that were coded subjectively showed differences for some of the attitudinal items but not for achievement.

3.3.2. List of Variables for Each Grade Level

Most of the questions asked of ninth-grade students were also asked of 12th-grade students. The analyses performed on these two grade levels can therefore be compared directly. At the lower grade levels, however, fewer questions were asked and the language was often much simplified from one grade to the next. These differences make direct comparisons at the lower grade levels much more difficult. To these difficulties we can add that at the first grade the questionnaires were filled out by the teachers for the student, whereas at the third grade the questions were read aloud by the teacher before being filled out by the student, and at the sixth grade the student read and filled out the questionnaire himself. Thus the nature of the nonresponses and errors are bound to be different at these different grade levels. What follows is the list of variables used.

Student Questionnaire Variables

Sex
Age
Mother's Birthplace
Area in Which the Student Has Spent Most of His Life
Type of Community in Which Student Has Spent Most of His Life
Racial-Ethnic Differences
Number of Persons Living in the Home
Number of Siblings
Number of Older Siblings
Number of Older Siblings Dropped Out of High School
Parents Speak a Foreign Language in the Home
Student Speaks a Foreign Language Outside of School
Number of Rooms in the Home
Who Acts as Father
Who Acts as Mother
Father's Occupational Level
Father's Educational Level
Mother's Educational Level
Family's Source of Income
Mother's Work

[3] A technical exposition of the mathematical and empirical properties of criterion-scaled variables is given in appendix I.

[4] See Beaton, 1967.

Mother's Desire for Child's Academic Excellence
Father's Desire for Child's Academic Excellence
School Discussions With Parents
Father's Desire for Child's Educational Level
Mother's Desire for Child's Educational Level
Frequency of Parents' PTA Attendance
Preschool Reading
Appliances in the Home
Reading Materials in the Home
Kindergarten Attendance
Attended Nursery School
Frequency of Changes in School
Recency of Change in School
Desire for Higher Education
College Plans
Number of Books Read During Summer
Hours Watching TV
Attitude Toward School
Students Own Desire To Excel
Study Time
Voluntary Absences
Extracurricular Activities
Outside Work
Social Rating
Brightness
Teacher's Expectations for Students To Excel
Life Condition
Work Success
Getting Ahead
Success in Life
Education in Job
Sacrifice
Want To Change
Learning Problem
Teaching Rate
Successful Life
Tough Job
Ability To Do Well
Occupational Level Preferred
Gets Along Well With Classmates
Avoids Disturbing Classmates
Arrives School on Time
Shows Desire To Learn
Shows Good Speaking Vocabulary
Pays Attention in Class
Moves From Activity to Activity Progressively
Assumes Responsibility
Attended Project Head Start
Grade Last Year
Liked by Classmates
Good Student
Likes School
Nonverbal Test Score
General Information, Total
Verbal Ability
Reading Comprehension
Mathematics Achievement

These variables were intercorrelated using a computer program that allows for an unequal number of observations on each variable. Unequal observations were usually caused by a student giving two responses to a question—either erroneously or because he did not adequately erase one of the answers (the machine scoring allowed only one answer). In order to reduce the computer processing time involved in developing the indices, random samples of approximately 10 percent of the students were taken at each grade level. The total sample size, random sample size, and range of missing observations are given below for the different grade levels:

Grade level	Total sample size	Random sample size	Range of missing values
12	96,403	10,048	600
9	133,136	12,000	600
6	123,385	11,185	1,100
3	129,774	12,072	2,000
1	71,460	6,890	500

For most of the variables there were few, if any, missing observations. For two or three of the variables, however, the missing observations did range as high as indicated in the above table.

3.3.3. Interpretation of the Indices

The intercorrelations of the above variables for each grade level were subjected to Principal Components analyses and Varimax rotations. Some of the variables—sex and age, for instance, with racial-ethnic differences and attitudes towards racial groups—were not entered into the analyses at all. The reason was that we wanted to retain them as separate variables for special studies. The individual tests were not included either, since the composite achievement score was to be used in later analyses as a dependent variable. In addition, a number of variables that were eliminated from the ninth-grade analyses were also eliminated from the 12th-grade analyses.

The analyses were performed in a sequence starting with the ninth grade followed by the 12th, sixth, third, and first grades. Since the analyses for the ninth and 12th grades were somewhat different from the others they will be discussed first.

In both the ninth and 12th grades the same 47 variables were subjected to a Principal Components analysis. Components with roots of one or greater were subjected to Varimax rotations. For the ninth grade, 10 components were rotated; for the 12th grade, 11. These components accounted for 45 and 49 percent, respectively, of the total variance. Seven of these rotated components were interpretable. They were considered to be essentially the same for both grade levels.

The other rotated components were deleted, either because the few variables on them could best be retained as separate variables or because the variables that were

related to them nevertheless belonged more meaningfully to other components. For example, PTA Attendance, Extracurricular Activities, and Foreign Language Spoken by Parents were retained as separate variables.

Since the rotated components for the ninth and 12th grades were considered to be highly similar in their content and meaning it seemed desirable to retain the same meaningful components for the lower grades. However, when the variables for the lower grades were subjected to Principal Components analyses and Varimax rotations meaningful components were not obtained; some of the components coalesced while others did not appear at all. This was due in part to the smaller number of variables at the lower grade levels. As a consequence of this result, subsets of variables at the lower grade levels that were considered to be representative of the indices (or meaningfully rotated components) for the ninth and 12th grades were each subjected to a Principal Components analysis. The weights from this first Principal Component were then taken as the index weights to be used in obtaining index scores.

The following tables contain those rotated components which, since they were found to be meaningful, will be referred to as indices. All variables other than those listed in the tables are considered to have zero weights for a particular index. A variable can belong to one and only one index. This rule tends to keep the intercorrelations of the index scores low, since a variable would tend to increase the correlation between two indices if it contributed positively to both of them.

Since the sixth-, third-, and first-grade weights are from the first Principal Component of the intercorrelations among the variables indicated, the percent of variance accounted for by that component is given at the bottom of the table. It should also be noted that the interpretations in the following tables are based on the results obtained for the ninth and 12th grades. All weights have been rounded to two places of decimals and the decimal points have been omitted.

Table 3.3.3.1 shows the weights for an index involving the student's own views of the expectations that he, his parents and his teacher hold for his academic performance. A student with a high score on this index feels that both his mother and his father want him to be one of the best students in his class. The student also feels that he himself would like to be one of the best students in his class, and that his teacher shares this view. The name of the index is Expectations for Excellence.

Table 3.3.3.1.—Index I: Expectations for Excellence

	Weights			
Title	12	9	6	3
Mother's Desire for Child's Academic Excellence	84	83	92	91
Father's Desire for Child's Academic Excellence	79	81	92	91
Student's Own Desire To Excel	67	64	----	----
Teacher's Expectations for Student To Excel	58	50	----	----
Percent of Variance Accounted for by the First Principal Component	----	----	84.96	82.21

Table 3.3.3.2 shows the weights for an index containing most of the variables that are commonly thought to be indicators of socioeconomic status. A student with a high score on this index tends to come from either a suburb of a large city or a medium-sized city, and to have a father who is engaged in a professional, sales, managerial, or technical job. He also tends to have one or two siblings and to live in a six- to 10-room house. Both his mother and his father come from the higher educational strata and there are a relatively large number of appliances and reading materials in his home. The name of the index is Socio-Economic Status.

Table 3.3.3.2.—Index II: Socio-Economic Status

	Weights				
Title	12	9	6	3	1
Type of Community in Which Student Has Spent Most of His Life	[1] 39	53	----	----	----
Number of Siblings	50	53	44	42	46
Number of Rooms in the Home	30	[1] 22	----	47	----
Father's Occupational Level	63	57	61	72	69
Father's Educational Level	71	66	78	84	85
Mother's Educational Level	66	64	75	80	81
Appliances in the Home	[2] 28	[2] 28	[2] 42	[2] 27	[2] 20
Reading Materials in the Home	29	29	43	28	21
Percent of Variance Accounted for by the First Principal Component	----	----	38.51	38.96	42.35

[1] Indicates that the variable came out higher on another index but was considered to belong more meaningfully to this index.

[2] Indicates that the variable was not included in the component analysis because it was so highly correlated with reading materials in the home, but instead was given almost the same weight as reading materials in the home.

Table 3.3.3.3 shows the weights for an index containing 11 variables related to the student's general outlook on life, especially as related to his role as a student. A student with a high score on this index feels that people who accept their condition in life are not necessarily happier, and that hard work is more important for success than good luck. He also believes that when he tries to get ahead he doesn't encounter obstacles, and that with a good education he won't have difficulty getting a job. He would not sacrifice everything to get ahead, and would not want to change himself. He does not think he would do better if his teachers went slower; he does think people like him have a chance to be successful. The name of the index is Attitude Toward Life.

Table 3.3.3.3.—Index IV: Attitude Toward Life

	Weights			
Title	12	9	6	3
Life Condition	34	[1] 25	----	----
Work for Success	43	41	----	----
Difficulty Getting Ahead	61	62	----	----
Education in Job	46	49	----	----
Sacrifice To Get Ahead	[1] 32	[1] 20	----	----
Want To Change	45	53	54	----
Learning Problems	55	56	56	----
Teaching Rate	56	57	----	----
Successful Life	58	60	68	----
Ability To Do Many Things Well	----	----	53	----
Liked by Classmates	----	----	45	[2] 100
Percent of Variance Accounted for by the First Principal Component	----	----	30.93	----

[1] Indicates that these variables had higher weights on other indices but belonged more meaningfully on this index, even with a low weight.

[2] There was only 1 variable at the 3d grade which was indicative of this index.

Table 3.3.3.4 shows the weights for an index containing variables related to a special aspect of the student's general attitude. A student with a high score on this index works either not at all or less than 20 hours a week at an outside job. In addition, he feels that he has a high social rating in the school, and is of the opinion that lack of success in life is not necessarily an individual's own fault. As for his own success, he says that the tougher he finds a job the harder he works at it, and that he can do many things well. In short, he tends to find life a breeze, even if it does require some effort. For this reason, the index is called Social Confidence.

Table 3.3.3.4.—Index III: Social Confidence [1]

Title	Weights	
	12	9
Outside Work	59	57
Social Rating	15	31
Success in Life	49	45
Tough Job	60	56
Ability To Do Many Things Well	74	51

[1] Social Confidence was highly correlated with Attitude Toward Life and, at the lower grade levels, coalesced with many of its variables. Consequently, it was not carrier further as an index.

Table 3.3.3.5 shows the weights for an index containing variables related to the student's family circumstances. A student with a high score on this index has his regular father and mother (as opposed to some substitute figure) fulfilling their respective roles. The major source of family income is the father's salary; the mother either does not work or works only part time. If this student has changed schools (and he tends not to have), it was not within the last 3 years. Nor does his family move often; if the family does, it tends to be across State lines. The name of the index is Family Structure and Stability. It will be seen that the weights for the ninth and 12th grades compare favorably except for the first variable. Here the 12th-grade weight becomes slightly negative, though it is still near zero. Inspection of the correlations of these variables with the first variable shows that they are low but positive. Hence, the small weight for the first variable might as well be regarded as zero.

Table 3.3.3.5.—Index V: Family Structure and Stability

Title	Weights				
	12	9	6	3	1
Area in Which Student Has Spent Most of His Life	−04	[1] 10			
Who Acts as Your Father	85	84	83	72	72
Who Acts as Your Mother	62	60	77	75	77
Family's Source of Income	76	73			
Mother's Work	21	[1] 20	28	57	70
Recency of Change in School	13	[1] 20			
Frequency of Changes in Schools			34	36	
Percent of Variance Accounted for by the First Principal Component			37.19	38.33	53.45

[1] Indicates that these variables had higher weights on other indices but belonged more meaningfully on this index, even with a low weight.

Table 3.3.3.6 shows the weights for an index containing variables related to the student's chances of receiving further education. A student with a high score on this index reports that both his mother and father want him to attend college, and that he himself both wants and plans to do so. He feels that he is one of the brightest students in his grade, and aspires to one of the higher occupational levels. The name of the index is Educational Desires and Plans.

Table 3.3.3.6.—Index VI: Educational Desires and Plans

Title	Weights			
	12	9	6	3
Father's Desire for Child's Educational Level	83	81		
Mother's Desire for Child's Educational Level	85	82		
Student's Desire for Higher Education	83	80	71	
Student's Plans for College	72	74		
Brightness	30	29		
Occupational Level Preferred	59	46	64	
Good Student			65	[1] 100
Percent of Variance Accounted for by the First Principal Component			44.88	

[1] This was the only variable that was indicative of this index at the 3d grade.

Table 3.3.3.7 shows the weights for an index containing variables related to the student's interpretation of his own role. A student with a high score on this index had daily or weekly discussions with his parents about his school work, and was read to frequently before he started school. He read many books during the summer and habitually watched TV from 1 to 3 hours per day. He reported that he would do most anything to continue in school, and backed up his words by studying from 1 to 3 hours a day outside school, and by seldom staying away from school just because he wanted to. The name of the index is Study Habits. It will be noted that although the weights on the first three variables are much lower for 12th-grade students than for ninth-grade students, intercorrelations of these variables for both grade levels show them to be similar.[5]

Table 3.3.3.7.—Index VII: Study Habits

Title	Weights			
	12	9	6	3
School Discussions With Parents	[1] 10	34	53	
Preschool Reading	[1] 06	33	60	70
Number of Books Read During Summer	[1] 06	48	58	75
Number of Hours Watching TV	35	49	43	49
Attitude Toward School	54	47	25	
Study Time	46	62	25	
Voluntary Absences	48	[1] 34		
Percent of Variance Accounted for by the First Principal Component			25.59	43.03

[1] Indicates that these variables had higher weights on some other index but were more meaningful on this index.

Table 3.3.3.8 shows the weights for an index containing variables related to the first-grade teacher's perception of the student's classroom behavior. A student with a high score on this index is regarded as "intelligent" and "well-adjusted." The name of the index is Classroom Behavior.

[5] See appendix IV.

Table 3.3.3.8.—Index VIII: Classroom Behavior

Title	Weights 1
Gets Along Well With Classmates	54
Avoids Disturbing Classmates	66
Arrives at School on Time	41
Shows Desire To Learn	77
Shows Good Speaking Vocabulary	61
Pays Attention in Class	84
Moves From Activity to Activity Progressively	82
Assumes Responsibility	77
Percent of Variance Accounted for by the First Principal Component	47.96

3.3.4. Index Score Intercorrelations

Index scores were computed for each student on the indices for his grade level. The variables used to form each index were first standardized to a mean of zero and a standard deviation of one,[6] then multiplied by their respective index weights and summed to obtain an index score. The index score intercorrelations, as well as their correlations with selected other variables, are given in the tables that follow. Since some of the weights were different for the ninth-grade index and its 12th-grade counterpart, and since we wanted to make the weights as comparable as possible, the ninth-grade index weights were used to obtain the index scores for both the ninth and 12th grades. The respective principal component weights were used for the other grade levels.

Table 3.3.4.1 shows that, with the exception of Social Confidence and Attitude Toward Life, all the indices are moderately correlated with one another. The values are unusually high for correlations obtained with the use of factor analytic techniques. The reader should bear in mind, however, that the variables have been scaled so as to be maximally related to the Achievement Composite. When the individual variables are weighted and summed, the sums are more highly correlated with the Achievement Composite than are the individual variables. This is because what they have in common tends also to be common with the Achievement Composite—that is, unless one rigidly adheres to all the orthogonal Varimax weights, a procedure that usually sacrifices a great deal of meaning. It will also be noted that the indices have lower intercorrelations for the 12th grade than for the ninth grade. This appears to reflect the influence of the dropouts: less variability among students, and hence lower correlations.

Table 3.3.4.2 gives the index intercorrelations for the sixth, third, and first grades. The intercorrelations for the sixth-grade indices tend to be much higher than for the third- and first-grade indices. These differences may be due in part to the different number and kinds of items that were used to represent some of the indices at the different grade levels. For example, five items were used to represent the Attitude Toward Life index at the sixth grade, but (out of necessity) only one at the third grade. The indices represented most adequately at grades six, three, and one are Socio-Economic Status and Family Structure. Even these, however, fluctuate greately in their intercorrelations. Since both the nature of the nonresponses and the definition of the indices vary at these lower grade levels, caution should be employed in interpreting observed differences from one grade level to the next. Greater confidence, however, might be placed in the observed similarities between the top two grade levels and the others.

Table 3.3.4.1.—Index Score Intercorrelations for the 9th and 12th Grades [1]

	9th/12th						
	I	II	III	IV	V	VI	VII
I. Expectations	100	26	18	28	18	51	34
II. Socio-Economic Status	40	100	22	29	36	48	34
III. Social Confidence	45	31	100	84	25	22	41
IV. Attitude Toward Life	47	38	85	100	26	33	40
V. Family Structure and Stability	37	47	33	33	100	20	38
VI. Educational Desires and Plans	54	54	36	45	33	100	35
VII. Study Habits	54	45	52	50	48	50	100

[1] The index intercorrelations above the main diagonal (descending from left to right with 1.00 as an entry) are for the 12th grade and those below the main diagonal are for the 9th grade. These correlations are computed on the full sample sizes of 96,409 12th-grade and 133,146 9th-grade students. All coefficients have been rounded to 2 decimal places and the decimal points have been omitted.

Table 3.3.4.2.—Index Score Intercorrelations for the 6th, 3d, and 1st Grades [1]

	3d/6th					
	I	II	III	IV	V	VI
I. Expectations	100	28	52	37	44	49
II. Socio-Economic Status	14	100	37	36	40	40
III. Attitude Toward Life	19	10	100	47	52	66
IV. Family Structure and Stability	25	27	19	100	35	47
V. Educational Desires and Plans	24	17	21	19	100	52
VI. Study Habits	22	30	18	28	20	100

[1] The index score intercorrelations above the main diagonal are for the 6th grade and those below the main diagonal are for the 3d grade.

	1st grade		
	II	IV	VIII
II. Socio-Economic Status	100	19	22
IV. Family Structure and Stability	19	100	11
VIII. Classroom Behavior	22	11	100

These correlations are computed on the full sample size of 123,386 6th-grade students; 129,774 3d-grade students; and 71,460 1st-grade students. All coefficients have been rounded to 2 decimal places and the decimal points omitted.

3.3.5. Index Correlations With Selected Other Variables

More can be learned about these indices from their degree of correlation with other variables not included in the index development. Some of these selected correlations are given in the following tables.[7]

Table 3.3.5.1 gives the correlations of the indices with three variables: the Achievement Composite, Racial-Ethnic Differences, and Sex. The reader will note that in this table the Achievement Composite is listed both as a variable and as an index in order to show its relationship with the other variables. Some of the indices here

[6] Using the means and standard deviations in appendix IV, under separate cover, to subtract and divide by, respectively.

[7] See also appendix V.

show a high degree of stability in their correlations. For example, Socio-Economic Status (SES) has a consistently high relationship with Achievement except at the first grade. In fact, all of the correlations at the first grade tend to be lower due to the high proportion of nonrespondents who were at the mean of the Achievement Composite, and were assigned this value as a score. The SES index tends also to have a consistently high relationship with Racial-Ethnic Differences. The Family Structure index tends to yield a consistent pattern of relationships with Achievement, Racial-Ethnic Differences and Sex. Apparently white, high-achieving girls enjoy (or say they enjoy) a more favorable Family Structure. The relationship of the Achievement Composite with Racial-Ethnic Differences is remarkably consistent for the different grade levels. Sex is also fairly consistent in its relationship with Achievement, girls being slightly higher achievers than boys.

Some of the indices show differing patterns of relationships for the different grade levels. For example, for the third grade Attitude Toward Life shows a drop in its correlation with both Achievement and Racial-Ethnic Differences. This drop is due in large part to the smaller number and differing nature of the variables used to represent this index at the lower grade levels.

These results suggest that it might also be instructive to conduct some systematic regressions. Several of the indices, such as Socio-Economic Status and Family Structure, can be regarded as influences that affect the student but are not directly affected by the school. Others, such as Expectations, Attitude Toward Life, Educational Desires and Plans, Study Habits and Achievement, can be viewed as being influenced by both the family and the school. It may therefore be best to keep this latter set as dependent variables, and then see what other indices and variables can be used in estimating them through multiple regression techniques. It is particularly instructive to see how the Home Background measures of Socio-Economic Status (SES) and Family Structure (FSS) relate to these other indices. Table 3.3.5.2 gives the squared multiple correlations (rounded to two places of decimals) at the different grade levels for SES alone (column 1), and for SES and FSS combined (column 2). The difference (after rounding) between these two squared correlations is given in the last column. It indicates the extent to which FSS is associated with Achievement that is independent of or unrelated to SES. A large value may indicate that FSS plays an important role in its relationship with the dependent variables. Inspection of the Difference column in table 3.3.5.2 shows that FSS tends to have its largest unique association for Expectations at grades six, three, and nine, respectively, and very little at grade 12. Although the values differ somewhat, this same trend tends to hold for Attitude Toward Life, except that FSS also tends to make a slight contribution at grade 12. Family Structure has virtually no unique association with Educational Desires and Plans at grades nine and 12. At least some of this variation may stem from the fact that different variables were used to represent the indices at grades six and three. Family Structure has a substantial unique association with Study Habits at all the grade levels but particularly at grades six, nine, and 12. It has virtually no relationship with Classroom Behavior or Achievement except at grades six and three, where there is a slight unique relationship. In summary, Family Structure appears to play its most important role in the development of Study Habits. It also contributes somewhat to the development of Attitudes Toward Life and Expectations, and has a small role at grades six and three in Achievement.

Table 3.3.5.1.—Index Correlations With Achievement, Racial-Ethnic Differences, and Sex

Variable title	Grade level	Index number and title							
		(I) Expectations	(II) Socioeconomic status	(IV) Attitude toward life	(V) Family structure and stability	(VI) Educational desires and plans	(VII) Study habits	(VIII) Classroom behavior	(IX) Achievement
Achievement Composite	12	35	48	42	23	49	23	----	----
	9	39	54	47	33	51	36	----	----
	6	26	50	38	33	48	37	----	----
	3	17	49	13	28	24	34	----	----
	1	----	38	----	13	----	----	37	----
Racial-Ethnic Differences[1]	12	00	35	28	27	06	13	----	45
	9	17	41	30	35	16	24	----	47
	6	17	37	22	30	22	22	----	49
	3	10	40	08	28	12	21	----	41
	1	----	40	----	25	----	----	15	40
Sex[2]	12	08	13	05	20	16	14	----	07
	9	20	26	21	34	16	36	----	13
	6	09	09	16	20	15	25	----	09
	3	12	04	12	18	11	16	----	09
	1	----	00	----	03	----	----	12	05

[1] Scored high for white and Oriental, low for Negroes, Puerto Ricans, Mexicans, and Indians.

[2] Scored high for female.

Table 3.3.5.2.—Squared Multiple Correlations [1] for Regression of Achievement and Attitude Indices on Home Background

Index number	Title	Grade level	SES (1)	SES and FSS (2)	Difference [2] (2)−(1)
I	Expectations	12	07	08	01
		9	16	20	04
		6	08	16	09
		3	02	07	05
IV	Attitude Toward Life	12	08	11	03
		9	15	18	03
		6	14	27	13
		3	01	04	03
VI	Educational Desires and Plans	12	23	23	00
		9	29	29	01
		6	16	21	05
		3	03	05	02
VII	Study Habits	12	12	19	08
		9	20	30	10
		6	16	28	13
		3	09	13	04
VIII	Classroom Behavior	1	05	05	00
IX	Achievement	12	23	23	00
		9	29	30	01
		6	25	27	03
		3	24	26	02
		1	15	15	00

[1] Rounded to 2 places of decimals.
[2] Apparent errors due to rounding after subtraction.

Table 3.3.5.3 contains the squared multiple correlations (rounded to two places of decimals) and their differences (after rounding) for various combinations of Home Background, Race, and Sex. The first question one can ask in perusing this table is: What is the association of Racial and Ethnic Differences after students have been equated for differences in their Home Background? The answer is to be found in columns (1) and (2) and in the differences that appear in the column headed (2) − (1). These columns show that, at grades nine and 12, Racial and Ethnic Differences have a substantial unique association with Achievement. For the same grades, however, the association of Racial and Ethnic Differences with Attitude Towards Life was very slight, as was its association with Expectations and with Educational Desires and Plans at grade 12.

Another crucial question here is whether Sex is related to these indices after students have been equated for differences in Home Background. Columns (1) and (4), with their differences, provide the answer: Sex appears to have a unique association with Study Habits for the third, sixth, and ninth grades, and with Classroom Behavior at the first grade. However, a related question immediately arises as to whether or not Sex is needed as an explanatory variable at this stage. But if we compare the column headed (3) − (2) with the one headed (3) − (4) we can see that Sex continues to have a unique association not only with Study Habits and Classroom Behavior, but with Achievement, Attitude Toward Life, Educational Desires and Plans, and Expectations. Hence, Sex may well be needed as an explanatory variable in predicting Study Habits and Classroom Behavior. Racial-Ethnic Differences, on the other hand, are important in analyzing Achievement (at all grade levels), Attitude Toward Life (at grades nine and 12), and Educational Desires and Plans, with Expectations (at grade 12).

SUMMARY

This section presented the results of analyses concerned with meaningful reduction of the questionnaire items to a manageable number. Factor analytic techniques—viz, Principal Components analyses and Varimax rotations—were used to determine how to group sets of correlated variables into indices. The indices developed

Table 3.3.5.3.—Squared Multiple Correlations [1] for Regression of Achievement and Attitude Indices on Home Background, Racial-Ethnic Differences, and Sex

Index number	Title	Grade level	Home background [2] (1)	Home background and race (2)	Home background, race, and sex (3)	Home background and sex (4)	Differences [3] (2)−(1)	(4)−(1)	(3)−(2)	(3)−(4)
I	Expectations	12	08	09	09	08	01	00	00	01
		9	20	20	20	20	00	00	00	00
		6	16	16	16	16	00	00	00	00
		3	07	07	07	07	00	01	01	00
IV	Attitude Toward Life	12	11	14	14	11	03	00	00	03
		9	18	19	20	18	02	01	01	02
		6	27	27	27	27	00	00	00	00
		3	04	04	05	05	00	01	01	00
VI	Educational Desires and Plans	12	23	24	25	24	01	01	01	01
		9	29	30	30	29	01	00	00	01
		6	21	21	21	21	00	01	01	00
		3	05	05	06	06	00	01	01	00
VII	Study Habits	12	19	19	20	19	00	00	00	00
		9	30	30	33	33	00	03	03	00
		6	28	28	31	31	00	02	02	00
		3	13	14	15	15	00	01	01	00
VIII	Classroom Behavior	1	05	06	07	07	00	02	02	00
IX	Achievement	12	23	32	32	23	09	00	00	09
		9	30	36	37	30	07	00	00	07
		6	27	37	37	27	09	00	00	09
		3	26	31	31	27	04	00	00	04
		1	15	22	22	15	07	00	00	07

[1] Rounded to 2 places of decimals after computation.
[2] The abbreviation for Home Background is HB. HB is comprised of SES and FSS.
[3] Apparent errors due to rounding after subtraction.

were found to be similar for ninth- and 12-grade students. The sixth, third, and first grades were brought into the same meaningful framework by grouping items according to the ninth- and 12th-grade results. The indices obtained for the different grade levels were labeled:

I. Expectations for Excellence [8]
II. Socio-Economic Status [9]
III. Social Confidence [10]
IV. Attitude Toward Life [8]
V. Family Structure and Stability
VI. Educational Desires and Plans [8]
VII. Study Habits [8]
VIII. Classroom Behavior [11]

All of these indices were found to be moderately correlated with Achievement, Racial-Ethnic Differences, and Sex.

Multiple regression analyses showed that Socio-Economic Status and Family Structure and Stability were important variables in predicting Achievement and other attitudinal indices. Other analyses showed that, after students had been equated for differences in Socio-Economic Status and Family Structure and Stability, Sex was important in explaining Study Habits and Racial-Ethnic Differences in explaining Achievement and Attitude Toward Life.

3.4. DEVELOPMENT OF THE TEACHER INDICES

All analyses were conducted for two groups of teachers labeled Elementary and Secondary. Teachers were sorted into one or other of these groups on the basis of their response to a question asking them what was the highest grade they taught. Those who said they taught the ninth grade or higher were included in the group labeled Secondary. Similarly, those who said they taught the eighth grade or lower were included in the group labeled Elementary.

The teacher questionnaire contained 102 questions. Of these, 72 were concerned with various aspects of the teacher's education, work experience, working conditions, preference for different kinds of students, involvement in guidance activities, opinions on social issues, and other items relating to the teacher's professional role. The latter part of the questionnaire consisted of a 30-item contextual vocabulary test. We decided to delete 26 of the first 72 items from the analyses because they seemed too specialized, or could best be retained as single items for special studies, or were of peripheral interest. Thus many of the items concerned with integration were judged to be best kept as single items for special studies. Likewise, many of the counseling questions were of only peripheral interest to us.

[8] Grades 3, 6, 9, and 12 only.
[9] Grades 9 and 12 only.
[10] All grade levels.
[11] Grade 1 only.

3.4.1. List of Variables

The variables used in the analyses are listed below. The manner of coding, with the detailed numerical codes and the values assigned to nonresponses are given in appendix XI.[12]

Teacher Questionnaire Variables

(1) Sex
(2) Age
(3) Area Spent Most of Life
(4) Type/Size of Community Spent Most of Life
(5) Racial-Ethnic Differences
(6) Area Graduated from High School
(7) Father's Occupational Level
(8) Father's Educational Level
(9) Mother's Educational Level
(10) Highest Degree Held
(11) Undergraduate Institution Attended
(12) Highest Degree Offered by Undergraduate Institution
(13) Area of Undergraduate Institution
(14) Percent of White Students at Undergraduate Institution
(15) Ranking of Academic Level of Undergraduate Institution
(16) Credit Beyond Highest Degree
(17) Years of Teaching Experience
(18) Years of Teaching in Present School
(19) Certification
(20) Assignment to Present School District
(21) Attend Summer Institutes
(22) Attend Summer Institutes for Teaching Culturally Disadvantaged
(23) Annual Teaching Salary
(24) Student Effort
(25) Student Ability
(26) Employment Status
(27) Member National Honorary
(28) Reenter Teaching
(29) Prefer Other School
(30) Type High School Preferred
(31) Socio-Economic Background of Student Preferred
(32) Preference for Student Ability
(33) School Reputation
(34) Percent White of Teacher's Students
(35) School Problems: External
(36) School Problems: Internal
(37) Member of Teachers' Associations
(38) Reads Educational Journals
(39) Teach Until Retirement
(40) Hours a Day Spent in Class Preparation
(41) Hours a Day Spent in Classroom Teaching
(42) Average Class Size
(43) Hours a Day Spent in Counseling
(44) Ability Grouping
(45) Contextual Vocabulary Score

[12] For the methods used see Mayeske et al., Technical Note No. 32 in the List of References. The actual questionnaire items are given in appendix VI.

These variables were intercorrelated using a computer routine that allows for the presence of an unequal number of observations on each variable. There are two occasions when this may happen. The first is when a question is answered twice. In this case, the routine eliminates both responses. One example is when an individual changes his answer and either forgets to erase his first response or erases it inadequately.[13] The second occasion is when either an item alternative or a nonresponse group was purposely eliminated. Thus, teachers who did not indicate their sex or age were not assigned a nonresponse value but instead were deleted from the analyses of the relations between sex and age and the other variables.[14]

The school sampling weights were used to reproduce teacher population values. There are approximately 36,000 Elementary and 24,000 Secondary teachers in the sample. When inflated by the sampling weights an estimate is obtained of approximately 830,000 Elementary and 556,000 Secondary teachers.

3.4.2. Percent of Variance Accounted for by the Principal Components

As mentioned earlier, the guiding purpose of our Principal Components analyses and Varimax rotations was to seek meaningful groupings of variables. Initially, certain variables were excluded from the factor analyses because it was felt that they would be more meaningful if kept separate, or that they might obscure what would otherwise be a meaningful solution. Thus, Sex, Racial-Ethnic Differences, Credit Beyond Highest Degree, and Contextual Vocabulary Score were kept out of the factor analyses. In addition, a number of different subsets of variables considered to be meaningful on a priori grounds were subjected to both Principal Components analysis and Varimax rotation.[15] For example, it was thought that such variables as Father's Education, Mother's Education, and Father's Occupation might form an index of socioeconomic background. Preliminary analyses showed, however, that although some of the a priori groupings did form a clear and single rotated component many of them did not.

Nevertheless, the full set of 41 variables, with only a few exceptions, did tend to form meaningful rotated components. Thus Percent of White Students at Undergraduate Institution, Percent White of Teacher's Students, and Average Class Size tended to form an unwanted racial differences component.[16] Similarly, Hours a Day Spent in Classroom Teaching, with Assignment to Present School District, tended to form a component along with Type/Size of Community Spent Most of Life and Annual Teaching Salary. This was an undesired rotated component since it reflected mainly rural-urban differences in school systems. We, therefore, eliminated all of these variables except the last two from further analyses. The remaining 36 variables were subjected to a Principal Component analysis. The magnitude of the roots (i.e., amount of variance accounted for by each component) and the Cumulative Percent of variance accounted for by each component are given for both Elementary and Secondary groups in appendix VII.

3.4.3. Interpretation of the Indices

For each group, those components that had a root of one or greater were subjected to a Varimax rotation. These components accounted for 55 and 54 percent of the total variance for elementary and secondary teachers, respectively.

Rotated components are interpreted by applying a suitable label to the variables that have a moderate to high weight. Assignment of the label is made on the basis of what the variables appear to have in common. Where a variable has a moderate weight on more than one rotated component it is assigned to the one on which it most meaningfully belongs. Thus, each variable belongs to one and only one component. The reason for this is that if a variable were allowed to belong to more than one rotated component, the correlations of the component scores would be unduly highly correlated as the same variable entered into both components. The analyses showed that the same rotated components could be obtained for both elementary and secondary teachers, although the weights differed slightly in some instances. Some of the rotated components were discarded because they involved only one or two variables, or because the variable clearly belonged on another component.

An interpretation of each rotated component is given below. Variables that are not listed on a component are considered to have a zero weight on it. The weights used and presented in the following tables have been taken directly from the Varimax solution. Hereafter, the interpreted components will be regarded as indices. All weights have been rounded to two places of decimals and the decimal points omitted.

Table 3.4.3.1 shows the weights for an index involving the teacher's experience and commitment. The variable with the highest weight is Number of Years Teaching. Next comes Age, followed by Number of Years Teaching in This School. The last variable, Expects To Remain in Teaching Until Retirement, appears to depend on being older and having more years of teaching experience. The name of the index is Experience.

Table 3.4.3.1.—Teacher Index I: Experience

Variable number	Variable title	Weights	
		Elementary	Secondary
2	Age	86	85
17	Number of Years Teaching	88	88
18	Number of Years Teaching in This School	79	82
39	Expects To Remain in Teaching Until Retirement	52	[1] 39

[1] Indicates that each of these variables had a higher weight on a small component that was later discarded.

[13] Machine scoring did not allow for more than one response.

[14] See appendix VI for the Alternatives eliminated by this method.

[15] A rotated component is often referred to for convenience as a factor.

[16] Apparently nonwhite teachers are less likely to have classes of average size than are white teachers.

Table 3.4.3.2 shows the weights for an index involving variables that reflect the teacher's view of his teaching relationship with the student body. A teacher who has a high score on this index feels that the students in his school try hard (24), and are of high academic ability (25). He also sees the school as having few problems of any kind (35, 36), and as enjoying a good reputation (33) with other teachers (i.e., with teachers not employed in the school). Such a teacher reports that he is currently teaching high-ability students (44), that he would not prefer to teach in some other school (29), and that he would reenter teaching as a profession if he could start all over again (28). The name of the index is Teaching Conditions.

Table 3.4.3.2.—Teacher Index II: Teaching Conditions

Variable number	Variable title	Weights	
		Elementary	Secondary
24	Student Effort	81	82
25	Student Ability	81	81
28	Reenter Teaching	[1] 18	[1] 15
29	Prefer Other School	−39	−44
33	School Reputation	64	72
35	School Problems: External	−64	−55
36	School Problems: Internal	−69	−67
44	Ability Grouping Taught	[2] 29	[2] 16

[1] Indicates that each of these variables had a higher weight on a small component that was later discarded.

[2] Indicate that this variable had a higher weight on another index called Teacher Preference, but that we decided it belonged more meaningfully on this index (see p. 21).

Table 3.4.3.3. shows the weights for an index related to the area in which the teacher spent most of his years prior to completion of college. A teacher with a high score on this index has moved relatively often from one area to another, while one with a low score has not. The name of the index is Localism of Background.

Table 3.4.3.3.—Teacher Index III: Localism of Background

Variable number	Variable title	Weight	
		Elementary	Secondary
3	Area Spent Most of Life	89	89
6	Area Graduated High School	91	91
13	Area of Undergraduate Institution	77	78

Table 3.4.3.4 shows the weights for an index involving some of the major variables that are considered indicators of socioeconomic status. The status in question, however, is not the teacher's current one, but rather that of his parents, which may be quite different. For this reason, the name of the index is Socio-Economic Background, not Socio-Economic Status.

Table 3.4.3.4.—Teacher Index IV: Socio-Economic Background

Variable number	Variable title	Weight	
		Elementary	Secondary
4	Type/Size of Community Spent Most of Life	[1] 27	[1] 11
7	Father's Occupational Level	73	75
8	Father's Educational Level	84	86
9	Mother's Educational Level	76	75

[1] Indicates a variable that had a higher weight on the Training index but was considered more interpretable here.

Table 3.4.3.5 shows the weights for an index involving the teacher's own education, both formal and informal. A teacher with a high score on this index has a relatively high salary (2), a more advanced degree (10), certification (19), and tenure (26). Since salary, certification and tenure are partly determined by the level of the degree held and partly by teaching experience, this index encompasses inservice training as well as formal academic preparation. As one would expect, it is somewhat correlated with the index for Experience (see p. 21). The name of this index is Training.

Table 3.4.3.5.—Teacher Index V: Training

Variable number	Variable title	Weight	
		Elementary	Secondary
10	Highest Degree Held	66	66
19	Certification	54	50
23	Salary	76	72
26	Tenure	54	57

Table 3.4.3.6 shows the weights for an index involving variables that are all related to various aspects of the teacher's undergraduate institution. Thus Undergraduate Institution Attended (11) is a rank assigned to each type of institution on the basis of the vocabulary score obtained by alumni of it who went into teaching. Usually, the high-ranking schools are the public and private universities; the private junior colleges and teachers' colleges rank lowest. The names of the other two variables in this index are self-explanatory. The name of the index itself is College Attended.

Table 3.4.3.6.—Teacher Index VI: College Attended

Variable number	Variable title	Weight	
		Elementary	Secondary
11	Undergraduate Institution Attended	71	50
12	Highest Degree Offered by Teacher's Undergraduate Institution	73	66
15	Teacher's Ranking of Academic Standing of Undergraduate Institution	59	71

Table 3.4.3.7 shows the weights for an index involving variables that refer to teaching as an activity. Thus the index includes preparation for teaching (40), maintenance of teaching skills (22, 37, 38), and performance of certain teacher-related obligations (43). The name of the index is Teaching-Related Activities.

Table 3.4.3.7.—Teacher Index VII: Teaching-Related Activities

Variable number	Variable title	Weight	
		Elementary	Secondary
22	Attends Summer Institutes for Teaching the Culturally Disadvantaged	[1] 16	50
37	Member of Teachers Associations	[1] 22	[1] 18
38	Reads Educational Journals	46	[1] 37
40	Hours a Day Spent in Classroom Preparation	71	60
43	Hours a Day Spent in Counseling (in addition to his official assignment)	59	64

[1] Denotes variables that had a higher weight on other small components, which were discarded.

Table 3.4.3.8 shows the weights for an index involving variables denoting certain perceived characteristics of the teacher's students. A teacher with a high score on this index prefers an academic school with a strong emphasis on college preparation (30), and a student body consisting of high-ability children of white collar and professional workers (31, 32). The name of the index is Preference for Student-Ability Level.

Table 3.4.3.8.—Teacher Index VIII: Preference for Student-Ability Level

Variable number	Variable title	Weight	
		Elementary	Secondary
30	Type of High School Preferred	65	68
31	Socio-Economic Background of Students Preferred	48	39
32	Preference for High Ability Students	68	66

Three components remained from the Elementary and two from the Secondary groups. These were discarded. The reason, in each case, was either that the few variables with high weights on them were already used on indices, or that there were only one or two variables on the component and these could more meaningfully be kept as single variables rather than be weighted and given the status of an index. However, of the 36 variables that were analyzed only two failed to be included in an index.[17]

3.4.4. Index Score Intercorrelations for Elementary and Secondary Teachers

Scores for each elementary and secondary teacher on each index were computed and then intercorrelated. Each variable was first standardized to a mean of zero and a standard deviation of one.[18] The standardized variables for each index were then multiplied by their respective Elementary weights, summed, and intercorrelated.[19] These intercorrelations are given in table 3.4.4.1. (see also appendix VIII).

Inspection of Table 3.4.4.1 shows that the index intercorrelations are what one might expect on the basis of the variables that comprise them. Thus, one would expect that the older, more experienced teachers (I) would tend to be more local in their background (i.e., would tend to have moved around less), would have lower socio-economic origins (IV), would have more training (V), went to a less highly ranked college (VI), and engaged in more teaching-related activities (VII) than their younger, less experienced counterparts.

Teaching Conditions (II) is virtually uncorrelated with all the other indexes except Preference for Student Ability Level (VIII). This is meaningful in that the teacher who is in a favorable teaching situation also tends to prefer high-ability students.

The negative relation of Socio-Economic Background (IV) to Experience (I) is probably due to an historical trend. Since Fathers' and Mothers' Educational Levels are used to define index IV, and since there has been a general increase in the level of education in the adult population in recent years, one would expect the younger teachers' parents to have more education than those of the older teachers. Socio-Economic Background (IV) is also related to Rank of College Attended (VI) and to Preference for Student-Ability Level (VIII).

It will be remembered that our objective was to reduce the number of variables in a meaningful way. This has now been accomplished. At the same time, the index scores have low intercorrelations. However, meaningful interpretations can be obtained when the index scores themselves are correlated.

3.4.5. Correlations of Elementary and Secondary Teacher Indices With Selected Other Variables

Nine of the 45 original variables were eliminated from the factor analyses either on the basis of the preliminary analysis or for special study and analysis later on. Also, two variables included in the analyses did not have a substantial weight on any of the indices.

The eliminated variables were correlated with the indices. In addition, some special variables used in the indices were selected out for use in special studies. Among these were sex, age, race, salary, and verbal score. The correlations are given in table 3.4.5.1 (see also appendix VIII). It will be seen from this table that the variables used to form part of an index are highly correlated with that index.[20] Thus, it is to be expected that Age (2) would be highly correlated with the Experience (index I)

[17] Attends Summer Institutes (21), and is Member of National Honorary Association (27).

[18] Using the means and standard deviations from appendix VII to subtract out and divide by, respectively.

[19] Since the Elementary and Secondary weights resembled each other closely, and since we wanted to keep the indices as comparable as possible, the Elementary weights were used for both categories of teachers.

[20] As a rule of thumb, correlations of 0.10 or less will not be discussed.

Table 3.4.4.1.—Index Intercorrelations for Elementary and Secondary Teachers [1]

		I	II	III	IV	V	VI	VII	VIII
I	Experience	100	02	−09	−18	54	−03	15	−08
II	Teaching Conditions	06	100	−01	07	00	06	01	09
III	Localism	−15	00	100	08	−04	05	03	01
IV	Socio-Economic Background	−30	06	09	100	−07	14	−02	16
V	Training	33	03	01	00	100	08	09	02
VI	College Attended	−16	03	09	19	07	100	01	09
VII	Activities	12	−01	03	−04	08	−02	100	−05
VIII	Preference	−08	10	01	15	04	12	−10	100

[1] The correlations for Elementary teachers are given below the main diagonal, running from upper left to lower right with entries of one, and the correlations for Secondary teachers are given above the main diagonal. The correlations are based upon approximately 36,000 elementary and 24,000 secondary teachers. All coefficients have been rounded to 2 decimal places and decimal points omitted.

Table 3.4.5.1.—Correlations of Elementary and Secondary Teacher Indices With Selected Other Variables

Variable number	Title	Index number and title: Experience (I)	Teaching conditions (II)	Localism (III)	Socio-economic background (IV)	Training (V)	College attended (VI)	Activities (VII)	Preference (VIII)
	ELEMENTARY TEACHERS[1]								
1	Sex	14	07	−04	03	−09	−03	00	−02
2	Age	89	06	−09	−27	26	−12	10	02
5	Racial-Ethnic Differences	−02	22	05	16	01	19	−18	16
14	Percent White at Undergraduate Institution	02	19	05	13	01	16	−18	15
16	Credits Beyond Highest Degree	20	−05	06	02	28	08	11	−01
20	Assignment to Present School District	09	05	−03	−07	−03	01	−01	00
21	Attends NSF-NDEA-ESEA Summer Institutes	03	−04	−01	−02	05	00	09	−02
23	Salary	31	02	08	02	79	08	02	03
27	Member National Honorary	03	03	04	05	09	05	08	06
34	Percent White of Teacher's Students	00	38	04	09	−04	10	−12	16
41	Hours/Day Spent in Classroom Teaching	−08	−01	00	08	07	04	−10	02
42	Average Class Size	−12	06	03	09	01	06	−03	07
45	Contextual Vocabulary Score	−07	09	06	20	12	19	−13	16
	SECONDARY TEACHERS[2]								
1	Sex	03	05	00	15	−14	01	03	01
2	Age	89	−01	−04	−16	45	−02	13	−07
5	Racial-Ethnic Differences	−03	17	02	12	07	19	−15	12
14	Percent White at Undergraduate Institution	01	16	03	11	08	15	−17	10
16	Credits Beyond Highest Degree	31	−05	02	00	32	08	07	04
20	Assignment to Present School District	00	06	−02	−05	00	02	03	−02
21	Attends NSF-NDEA-ESEA Summer Institutes	09	00	02	−04	18	−01	07	12
23	Salary	48	00	00	−03	81	11	03	00
27	Member National Honorary	04	04	04	06	08	05	09	09
34	Percent White of Teacher's Students	−05	27	04	07	−01	10	−11	11
41	Hours/Day Spent in Classroom Teaching	−08	03	00	05	−03	03	−03	06
42	Average Class Size	−04	03	01	06	00	−01	−03	07
45	Contextual Vocabulary Score	00	07	04	18	10	15	−05	22

[1] The correlations are based upon approximately 36,000 elementary teachers.
[2] The correlations are based upon approximately 24,000 secondary teachers.

and Salary (23) with Training (index V). Sex (1) is related slightly to Experience (index I) for elementary teachers, which indicates that slightly more of the older, more experienced elementary teachers are women. Since Age (2) is used in the Experience index, we can expect it to be correlated with other indices that are also correlated with this index.

The correlations that *are* of major interest are those between the racial difference variables (5, 14, 34) and the indices. Thus, Racial-Ethnic Differences (5), Percent of White Students at Teacher's Undergraduate Institution (14), and Percent White of Teacher's Students (34) are all correlated with Teaching Conditions (index II), Socio-Economic Background (index IV), College Attended (index VI), Teaching-Related Activities (index VII), and Preference for High Ability Students (index VIII). What these correlations indicate is that white teachers tend to teach in predominantly white schools. They think that these schools provide more favorable teaching conditions (see index II). They also have a higher socioeconomic background (index IV) than their nonwhite counterparts, and tend to get their training at higher ranked undergraduate institutions (index VI). Finally, they are less involved in Teaching-Related Activities (index VII) than their nonwhite counterparts, and prefer to teach higher ability students—who, in turn, happen to be predominantly white.[21]

Other meaningful correlations are between Credit Beyond Highest Degree (16), Experience (index I), and Teaching-Related Activities (index VII). Average Class Size (42) is negatively related to Experience (index I), which indicates that the older, more experienced teachers tend to have both larger and smaller classes than do the younger teachers. The correlations of Contextual Vocabulary Score (45) with Socio-Economic Background (index IV), Training (index V), College Attended (index VI), Activities (index VII), and Preference for Student Ability Level (index VIII) indicated that the higher scoring teachers tend to have a higher socioeconomic background and more training. They also went to a higher ranking college, are less heavily involved in teaching-related activities, and have a greater preference for high-ability students.

Regression analyses using these correlations are presented in a later chapter, together with special summary analyses of school personnel and personnel expenditure variables.[22]

Summary

This section presented the results of analyses concerned with reducing the number of items from the Teacher Questionnaire. Factor analytic techniques (Principal Components analyses and Varimax rotations) were used to determine how to group sets of correlated variables into indices. The indices were found to be highly similar for both elementary and secondary teachers. Consequently, the weights for elementary teachers were used to obtain index scores.

[21] See the student index intercorrelations earlier in this chapter.

[22] Pp. 81-93.

The indices and their interpretive titles are:

I. Experience
II. Teaching Conditions
III. Localism of Background
IV. Socio-Economic Background
V. Training
VI. College Attended
VII. Teaching-Related Activities
VIII. Preference for Student Ability Level

Index scores were computed and intercorrelated for Elementary and Secondary teachers. These correlations were low in magnitude and could be meaningfully interpreted. Correlations of other variables with the indices showed that Racial-Ethnic Differences, Percent of White Students at Teacher's Undergraduate Institution, and Percent White of Teacher's Students were correlated with Teaching Conditions (index II), Socio-Economic Background (index IV), College Attended (index VI), Teaching-Related Activities (index VII), and Preference for High-Ability Students (index VIII).

3.5. DEVELOPMENT OF THE PRINCIPAL AND SCHOOL INDICES

Principals were grouped into Elementary, Secondary, and Total, and analyses were conducted for each group. The elementary and secondary principals were selected on the basis of their response to a question concerned with the highest grade included in their school.[23] Thus, those principals who said their school included the ninth grade or higher are included in the group labeled Secondary, while those who said their school included the eighth grade or less are included in the group labeled Elementary. The group of schools labeled Total consists of all the principals included in the sample. Analyses of the Total group were conducted in order to compare their similarities and differences with the Elementary and Secondary groups. Since we wanted, insofar as possible, to maintain the same conceptual framework when working with all the schools, we decided to use the groupings obtained from the Total schools group if sufficient similarities were obtained between them and the other two groups.

Two forms of the principal questionnaire were used in the survey. The first contained 100 questions. The second was a summary questionnaire that was sent to all principals who failed to respond to the original questionnaire. This latter form contained approximately 92 questions some of which were different in format from the original questionnaire. In the present analysis, we used only those questions that were common to the two forms and were presented in the same format. There were approximately 84 items from these two forms that were judged to be of interest to the investigators. These items do not always correspond to single questions; for example, one question might have had several items. Thus, question 13 had 18 subitems concerned with the different kinds of school facilities the school had. All of these items were used as variables in the analyses (see p. 24). Many of them, however, were judged to be best kept as single items for special studies rather than being grouped with other variables. Thus items concerned with integration and racial-ethnic group membership were left as separate items.

The variables used in the analyses are listed below.

Principal Questionnaire: Set of 22 Variables

(1) Acreage of Plant Site
(2) Age of Building
(3) Pupils Per Room
(4) Centralized Library
(5) Auditorium
(6) Gymnasium
(7) Cafeteria
(8) Athletic Field
(9) Hot Meal Kitchen
(10) Infirmary or Health Room
(11) Years as a Principal
(12) Years as a Principal in This School
(13) Age
(14) Sex
(15) Highest Degree Held
(16) Undergraduate Institution Attended
(17) Highest Degree Offered by Undergraduate Institution
(18) Area of Undergraduate Institution
(19) Credit Beyond Highest Degree
(20) Principal's Estimate of School's Reputation
(21) Percent of Time Teaching
(22) Principal's Salary

Principal Questionnaire: Set of 62 Variables

(1) Free Kindergarten (Elementary)
(1) College Representatives (Secondary)
(2) Free Nursery (Elementary)
(2) Principal's Salary (Secondary)
(3) State Accreditation
(4) Regional Accreditation
(5) Compulsory Attendance Law
(6) Rural-Urban Location
(7) Principal's Estimate of Student's Socio-Economic Status
(8) Public Library
(9) PTA Attendance
(10) Length of School Day
(11) Courses From Different Teachers
(12) Volumes in Library
(13) Grouping
(14) Percent Highest Track
(15) Percent Lowest Track
(16) Shop Tools
(17) Biology Lab
(18) Chemistry Lab
(19) Physics Lab
(20) Language Lab
(21) Typing Room

[23] See appendix IX.

(22) Percent to Higher Track
(23) Movie Projectors
(24) Percent to Lower Track
(25) Percent Free Lunch
(26) Percent Free Milk
(27) Texts Provided
(28) Age of Texts
(29) Biology Text (Secondary)
(30) Availability of Texts
(31) Percent of Students in Part-Time Attendance
(32) Intelligence Testing
(33) Achievement Testing
(34) Interest Testing
(35) Accelerated Curriculum
(36) Pupils Per Teacher
(37) Teacher Turnover
(38) Teacher Tenure
(39) Teacher Exams
(40) Art Teacher
(41) Music Teacher
(42) Speech Teacher
(43) Mental Health
(44) Reading Teachers
(45) Guidance Counselors
(46) Librarian
(47) Nurse
(48) Attendance Officer
(49) Pupil Assignment
(50) Enrollment
(51) Daily Attendance
(52) Percent White
(53) Student Transfers In
(54) Student Transfers Out
(55) Principal's Estimate of School Problems
(56) Nonwhites Entered
(57) Promotion Policy
(58) Extracurricular Activities
(59) Homework
(60) Remedial Math
(61) Remedial Reading
(62) Special Classes

3.5.2. Percent of Variance Accounted for by Principal Components, With Interpretation of Indexes Obtained

The set of 22 variables and the set of 62 variables were both subjected to Principal Components analysis and Varimax rotations. These analyses did not yield any meaningful groups or factors. Usually the factors (i.e., the rotated components) contained both variables that meaningfully belonged together and variables that did not lend themselves to any clear interpretation. For example, a school size and facilities factor emerged, but it also included a large number of unwanted policy variables such as tracking and use of teacher examinations. Although these analyses did not form clear factors, their results were useful in forming meaningful subsets of variables. Each subset so formed was subjected to a Principal Components analysis; the weights from the first Principal Component were used to weight the variables in order to form indices. The results of these analyses are given below.

For each subset of variables the weights from the first Principal Component and the percent of variance accounted for by that component are given for the Elementary, Secondary, and Total groups of schools. The percent of variance is computed by means of the same theorem as before (see p. 8). A variable is allowed to belong to one and only one component.[24] This latter rule prevents the component scores from being unduly highly correlated.

Table 3.5.2.1 shows the weights for an index involving the school's physical attributes. A school with a high score on this index tends to have a large plant, a central library, an auditorium, a gymnasium, a cafeteria, an athletic field, a kitchen, and an infirmary or health room. Such a school, in other words, tends to have many of the features usually associated with large schools. The weights are similar for all three analyses, although the percent of variance accounted for by the first principal component for the Secondary analysis is somewhat less than for the Elementary and Total analyses. The name of the index is Plant and Facilities.

Table 3.5.2.1.—School Index I: Plant and Facilities

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
1	Area of Plant	65	64	49
4	Central Library	56	49	50
5	Auditorium	70	75	48
6	Gymnasium	58	51	52
7	Cafeteria	69	73	66
8	Athletic Field	43	40	50
9	Kitchen	62	60	56
10	Infirmary or Health Room	46	52	33
	Percent of Variance Accounted for by First Principal Component	35.20	35.13	26.17

[1] Refers to those in the 22 variable set (p. 23).

Table 3.5.2.2 shows the weights for an index similar to the teacher index for Experience (see table 3.4.3.1). A principal with a high score on this index is older, has been a principal for many years, and has been at his present school for quite a few years. It will be noted that the weights are much the same for all three analyses. The name of the index is Principal's Experience.

Table 3.5.2.3 shows the weights for an index that includes two of the variables already included in the teacher

Table 3.5.2.2.—School Index II: Principal's Experience

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
11	Number of Years as a Principal	90	90	91
12	Number of Years as a Principal in This School	84	84	83
13	Years of Age	80	79	83
	Percent of Variance Accounted for by First Principal Component[2]			

[1] Refers to those in the 22 variable set (p. 23).
[2] These weights are taken from a Varimax rotation performed upon 3 components extracted from variables 11, 12, 13, 15, 16, 17, 18, and 22.

[24] For the remainder of this report the interpreted components will be referred to as indices.

Table 3.5.2.3.—School Index III: Principal's Training

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
15	Highest Degree Held	87	87	84
22	Salary	86	86	81
	Percent of Variance Accounted for by First Principal Component			

[1] Refers to those in the 22 variable set.

index called Training (see table 3.4.3.5). A principal with a high score on this index has an advanced degree and a high salary. The index may be regarded as a surrogate for the school's total expenditures, since a school that can afford a highly trained, well-paid principal can also afford to spend large amounts on other things (see section 4.3, especially 4.3.4). The weights here are very similar for all three analyses. The name of the index is Principal's Training.

Table 3.5.2.4 shows the weights for an index that resembles the teacher index called College Attended (see table 3.4.3.6). A principal with a high score on this index attended a highly ranked undergraduate institution that offered an advanced degree and was located in another area or State. The weights tend to be similar for all three analyses, although the Secondary weights differ somewhat from the others. The name of the index is College Attended.

Table 3.5.2.5 shows the weights for an index that covers a wide variety of school facilities. A school with a high score on this index has many volumes in its library, a shop, laboratories for biology, chemistry, physics, and foreign languages, a typing room, and movie projectors. It also offers a number of extracurricular activities. Many of these attributes are commonly found in schools that are large, affluent, or both. It will be noted that the principal component for Total schools accounts for a much higher percent of the variance than for Elementary or Secondary schools. Evidently the differences between Elementary and Secondary schools make a contribution to the Total analysis. These differences, to the extent that they are reflected as differences in the principal component weights, appear to be in variables 12, 16, 20, 21, 23, and 58. And indeed we would expect to encounter differences between Elementary and Secondary schools on many of these variables. It will also be noted that although the absolute values of weights for the three groups are different, their relative values tend to be similar. Thus variables

Table 3.5.2.4.—School Index IV: College Attended

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
16	Ranking of Undergraduate Institution	80	78	59
17	Highest Degree Offered by Undergraduate Institution	82	81	73
18	Location of Undergraduate Institution	20	25	54
	Percent of Variance Accounted for by First Principal Component			

[1] These weights are taken from a Varimax rotation performed upon 3 components extracted from variables 11, 12, 13, 15, 16, 17, 18, and 22.

Table 3.5.2.5.—School Index V: Instructional Facilities

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
12	Number of volumes in the Library	59	26	55
16	Shop	84	44	52
17	Biology Labs	87	78	71
18	Chemistry Labs	87	79	71
19	Physics Labs	86	78	73
20	Foreign Language Labs	64	39	47
21	Typing Rooms	84	41	60
23	Movie Projector	57	30	47
58	Extracurricular Activities	86	51	75
	Percent of Variance Accounted for by First Principal Component	61.26	30.76	38.81

[1] Refers to those in the 22 variable set.

that have high weights for the Total group often have high weights for the others, too. The name of the index is Instructional Facilities.

Table 3.5.2.6 shows the weights for an index involving a school's specialized services. A school with a high score on this index has many of the special services a large budget would support. Their nature is evident from the list of variable titles. Special Classes included separate instruction for the mentally retarded, those with speech impairments, etc. As one would expect, services of this kind are most often found in large schools. The percent of variance accounted for by the first principal component is much greater for the Total group than for either of the others. The differences between the Elementary and Secondary groups, to the extent that they are reflected as differences in the principal component weights, appear to be due mainly to the Number of Guidance Counselors, and the availability of an Attendance Officer. As before, the relative weights for the three groups are more similar than the absolute values. Thus variables that have high weights for the Total group tend also to have high weights for the other two groups. The name of the index is Specialized Staff and Services.

Table 3.5.2.7 shows the weights for an index involving the school's use of tracking. A school with a high score on this index practices ability grouping and tracking extensively. It is also a school in which there is an accelerated curriculum, and in which a large amount of movement occurs between tracks. The percent of variance accounted for by the first principal component is slightly greater for the Total and Elementary than for the Sec-

Table 3.5.2.6.—School Index VI: Specialized Staff and Services

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
1	Free Kindergarten	45	61	None
40	Art Teacher	75	61	80
41	Music Teacher	62	55	57
42	Speech Teacher	51	68	60
43	Mental Health Provisions	57	62	69
44	Remedial Reading Teacher	43	32	47
45	Number of Guidance Counselors	66	32	81
46	Librarian	66	53	65
47	Nurse	67	69	73
48	Attendance Officer	21	17	36
62	Special Classes	65	63	77
	Percent of Variance Accounted for by First Principal Component	61.26	38.81	30.76

[1] Refers to those in the 62 variable set (pp. 23–24).

Table 3.5.2.7.—School Index VII: Tracking and Ability Grouping

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
13	Ability Grouping or Tracking	82	81	81
14	Proportion of Students in Highest Track	82	84	75
15	Proportion of Students in Lowest Track	81	83	69
22	Proportion of Students Moved to Higher Track	63	64	64
24	Proportion of Students Moved to Lower Track	69	69	67
35	Accelerated Curriculum	33	28	38
	Percent of Variance Accounted for by First Principal Component	49.52	50.45	44.88

[1] Refers to those in the 62 variable set.

ondary groups. However, the weights for all three groups are highly similar. The name of the index is Tracking and Ability Grouping.

Table 3.5.2.8 shows the weights for an index involving the school's use of testing. A school with a high score on this index administers intelligence, achievement and interest tests quite frequently. The percent of variance accounted for by the first principal component is somewhat greater for the Secondary than for the other two groups. This indicates that a Secondary school that practices one kind of testing is more likely to practice other kinds as well. As before, the relative order of the weights is much the same for all three groups.

Table 3.5.2.8.—School Index VIII: Frequency of Testing

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
32	Frequency of Intelligence Testing	78	70	84
33	Frequency of Achievement Testing	76	68	83
34	Frequency of Interest Testing	47	58	57
	Percent of Variance Accounted for by First Principal Component	46.83	43.04	57.11

[1] Refers to those in the 62 variable set.

Table 3.5.2.9 shows the weights for an index involving the amount of Turnover among a school's student body. A school with a high score on this index experiences much student turnover, both influx and outflow. The slightly lower weights and lower percent of variance accounted for by the first principal component indicate that the trend is slightly less pronounced for the Secondary group. The name of the index is Pupil Transfers.

Table 3.5.2.10 shows the weights for an index involving the extent of a school's remedial programs. A school with a high score on this index has a large proportion of its students in such programs. The weights and percent of variance accounted for by the first principal component

Table 3.5.2.9.—School Index IX: Pupil Transfers

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
53	Percent of Pupil Transfers In	90	90	87
54	Percent of Pupil Transfers Out	90	90	87
	Percent of Variance Accounted for by First Principal Component	81.32	81.97	76.41

[1] Refers to those in the 62 variable set.

Table 3.5.2.10.—School Index X: Remedial Programs

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
60	Percent of Students in Remedial Math	91	92	90
61	Percent of Students in Remedial Reading	91	92	90
	Percent of Variance Accounted for by First Principal Component	83.43	83.70	81.83

[1] Refers to those in the 62 variable set.

are very similar for each group. The name of the variable is Remedial Programs.

Table 3.5.2.11 shows the weights for an index involving the school's free milk and lunch programs. A school with a high score on this index has a large proportion of its students enrolled in such programs. The weights and percentages of variance accounted for by the first principal component are similar for the different groups. The name of the index is Free Milk and Lunch Programs.

Table 3.5.2.11.—School Index XI: Free Milk and Lunch Programs

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
25	Percent of Students Who Get Free Lunch	87	86	89
26	Percent of Students Who Get Free Milk	87	86	89
	Percent of Variance Accounted for by First Principal Component	75.75	74.59	79.94

[1] Refers to those in the 62 variable set.

Table 3.5.2.12 shows the weights for an index involving a school's educational standing. A school with a high score on this index had both regional and State accreditation. The differences in the weights and the percent of variance accounted for by the first principal component indicate that Elementary schools are more likely to have either both or neither kinds of accreditation. This is only one illustration of the fact that the magnitude of the percent of variance accounted for by the first principal component is directly related to the degree of intercorrelation that exists among a set of variables. When this percentage is high, the variables tend to be highly intercorrelated; when it is low, the degree of correlation also tends to be low. A high correlation would exist between the two types of accreditation when a school that has one type of accreditation tends also to have the other kind, and vice-versa. The name of the index is Accreditation.

Table 3.5.2.13 shows the weights for an index involving a school's textbooks. A school with a high score on this index tended to have older textbooks. All sets of weights

Table 3.5.2.12.—School Index XII: Accreditation

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
3	State Accreditation	86	88	79
4	Regional Accreditation	86	88	79
	Percent of Variance Accounted for by First Principal Component	73.15	77.76	62.09

[1] Refers to those in the 62 variable set.

Table 3.5.2.13.—School Index XIII: Age of Texts

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
28	Age of Texts	77	77	77
29	Date of Reading Books (Elementary) or Date of Biology Text (Secondary)	77	77	77
	Percent of Variance Accounted for by First Principal Component	58.77	58.77	58.77

[1] Refers to those in the 62 variable set.

are the same, as are the sets of variance percentages. The name of the index is Age of Texts.

Table 3.5.2.14 shows the weights for an index involving the distribution of texts. A school with a high score on this index has each student buy his own texts, and suffers from no shortage of them. A school with a low score is more likely to provide texts free, and to have a shortage of them. The weights and percent of variance accounted for are highly similar for each group. The name of the index is Availability of Texts.

Table 3.5.2.14.—School Index XIV: Availability of Texts

Variable number[1]	Variable title	Weights		
		Total	Elementary	Secondary
27	Texts Provided	74	73	73
30	Sufficient Texts Available	74	73	73
	Percent of Variance Accounted for by First Principal Component	54.76	52.81	52.81

[1] Refers to those in the 62 variable set.

SUMMARY

This chapter presented the results of analyses concerned with reducing the more than 400 questionnaire variables into indices. The purpose of this was to avoid making later analysis too complex. Factor analytic techniques (Principal Components analyses and Varimax rotations) were used to group sets of correlated variables into indices. Items from the student, teacher, and principal questionnaires were each subjected to these analyses. The indices were found to be highly similar for the Elementary, Secondary and Total school groups, and consequently the weights for Total schools were used to obtain index scores.

The following meaningful indices were obtained:

Students:
- Expectations for Excellence [25]
- Socio-Economic Status [26]
- Social Confidence [27]
- Attitude Toward Life [28]
- Family Structure and Stability [26]
- Educational Desires and Plans [25]
- Study Habits [25]
- Classroom Behavior [28]

Teachers:
- Experience
- Teaching Conditions
- Training
- College Attended
- Localism of Background
- Socio-Economic Background
- Teaching-Related Activities
- Preference for Student-Ability Level

Principals and Schools:
- Physical Plant and Facilities
- Principal's Experience
- Principal's Training
- Principal's College Attended
- Instructional Facilities
- Specialized Staff and Services
- Tracking and Ability Grouping
- Frequency of Testing
- Pupil Transfers
- Remedial Programs
- Free Milk and Lunch Programs
- Accreditation
- Age of Texts
- Availability of Texts

[25] Grades 3, 6, 9, and 12 only.
[26] All grade levels.
[27] Grades 9 and 12 only.
[28] Grades 1 only.

4. Zero-Order Correlations of Selected Variables

Zero-order correlations are correlations that are not equated for associations with other variables. This chapter presents and discusses zero-order correlations of variables that are deemed to be of special interest either because they are used extensively in later analyses or because they are of general interest. Our discussion here is intended as a reference source, that is, we attempt to summarize the relationships but not to make causal inferences about what school variables influence different outcomes. However, we also attempt to show what emphasis should be given to the magnitude of each set of correlations. For causal inferences the reader is directed to the chapters that follow.

Section 4.1 contains an enumeration of all the indices and variables used in this report.[1] For all of these variables the unit of analysis is the school. Variables that involve information from the Principal questionnaires are presented first in the list and tables. Next come the variables that involve information from the Teacher questionnaires, followed by those that involve information from the Student questionnaires. Since, as we have said, the school is the unit of analysis in this chapter and those that follow, the Teacher variables are represented by the mean or average of the teachers' responses for each school. Similarly, each Student variable is the mean or

[1] Many of the variables that did not enter into any index were retained for further use, and are included in the analyses given in this chapter as well as in some of the following chapters.

average of the students' responses for the appropriate grade level in each school. For example, Student Body's Socio-Economic Status (SES) may be the average SES score for the students in, say, the sixth grade of a particular school.

The students were surveyed about 3 weeks after the beginning of the fall semester. This meant that if they happened to be in a new school the staff and resources of that school could not have had much of an opportunity to influence their achievement and attitudes. Similarly, if they were in the same school the teachers in their new grade level could not yet have had much of an opportunity to influence them. In order to aggregate or average for each grade level those teachers who might have had an influence on the students, the following steps were taken. For grades one, three, and six only, teachers who taught grades of kindergarten through sixth grade were aggregated;[2] for grade nine, kindergarten through eighth-grade teachers were aggregated; for grade 12, only teachers who taught grades nine through 12 were aggregated. In the case of the principals, schools with grades nine through 12 were included in the 12th grade analyses, while schools with grades one through eight were included in the ninth-grade analyses. For grades one, three, and six, if the school had student information for that particular grade level, then the principal (and school) information was also brought into the analysis.

4.1. LIST OF INDICES AND VARIABLES

The following is a list of the indices and variables used in the analyses that follow. Detailed information can be found in chapter 3 and in the appropriate appendices:

Plant and Physical Facilities
Age of Building
Pupils Per Room
Instructional Facilities
Specialized Staff and Services
Tracking
Testing
Pupil Transfers
Remedial Programs
Free Milk and Lunch Programs
Accreditation
Age of Texts
Availability of Texts
Compulsory Attendance Law
Rural-Urban Location
Principal's Estimate of Students' Socio-Economic Status
PTA Attendance
Pupil-Teacher Ratio
Teacher Turnover
Teacher Tenure
Teacher Exams
Pupil Assignment
Enrollment (Size)
Daily Attendance
Principal's Estimate of the Percent of White Students in the School
Principal's Estimate of School Problems
Nonwhites Entered
Principal's Estimate of the School's Reputation
Promotion Policy
Homework
Free Nursery
Length of School Day
Courses From Different Teachers
Percent of Students in Part-Time Attendance
Percent of Graduates Going on to College (12th-grade schools only)
Percent of Nonwhite Graduates Going on to College (12th-grade schools only)
Percent of Graduates Going on to Vocational Training (12th-grade schools only)
Percent of Nonwhite Graduates Going on to Vocational training (12th-grade schools only)
Percent of Boy Dropouts (12th-grade schools only)
Principal's Experience
Principal's Training
Principal's College Attended
Principal's Sex
Principal's Credits Beyond Highest Degree
Teacher's Experience
Teacher's Training
Teacher's Socio-Economic Background
Teacher's Localism
Teacher's College Attended
Teaching Conditions
Teaching-Related Activities
Preference for Student-Ability Level
Teacher's Sex
Teacher's Racial-Ethnic Group Membership
Percent of White Students at Teacher's Undergraduate Institution
Teacher's Credits Beyond Highest Degree
Teacher's Assignment to Present School District
Attendance at Summer Institutes
Annual Teaching Salary
National Honorary Society
Percent White of Teacher's Students
Number of Hours/Day Spent in Classroom Teaching
Contextual Vocabulary Score
Expectations for Excellence[3]
Socio-Economic Status
Attitude Toward Life[3]
Family Structure and Stability
Educational Plans and Desires[3]
Study Habits[3]
Achievement
Sex
Racial-Ethnic Group Membership
Parents Speak a Foreign Language in the Home
Student Speaks a Foreign Language Outside of school

[2] On the assumption that specialized teachers—i.e., those in such subjects as music, art, and remedial reading—teach at several grade levels within this range.

[3] Grades 12, 9, 6, and 3 only.

Frequency of Parents' PTA Attendance [4]
Kindergarten Attendance
Nursery School Attendance [5]

4.2. PERCENT OF TOTAL VARIANCE ASSOCIATED WITH SCHOOLS STUDENTS ATTEND

For the purposes of this survey, differences among students are of two kinds: differences between schools and differences within schools. For example, some schools have more students who come from higher socioeconomic strata. However, within any one of these schools students may differ in socioeconomic background. These two kinds of differences add or sum to the total differences that exist among students in, say, socioeconomic background or achievement level, as the following equation [6] illustrates:

Total	Total	Total
Differences =	Differences +	Differences
Among	Among	Among Students
Students in	Schools in	Within Schools in
Attribute X	Attribute X	Attribute X

If this equation is divided by the Total Differences Among Students it expresses the Total Differences Among Schools and the Total Differences Among Students Within Schools as percentages.

Table 4.2 gives the percent of the total variance of selected variables of interest that is associated with the schools students attend, or, in other words, the ratio of the among school variance to the total variance, corrected for the appropriate degrees of freedom.[7] The percentage figures in table 4.2 represent upper limits for the percent of variance that can be explained by studying the correlates of school differences. Thus, no more than 37 percent of the total achievement variance at the ninth grade can be explained by correlating school variables (i.e., student and teacher averages, as well as principal items) with the average achievement levels of the schools (for a preliminary report on this, see Beaton, 1968). It is difficult to infer that differences in these percentages at the different grade levels reflect the influence or lack of influence of the schools. The reason, as we shall see in chapter 5, is that the correlations of school variables with achievement and other outcome measures change in systematic ways at the different grade levels. This is true even though the percent of total variance associated with the schools remains the same from one grade level to the next.

Table 4.2.—Percent of Total Variance for Different Student Variables That Is Associated With the Schools Students Attend

Variable title	Grade level				
	12	9	6	3	1
Socio-Economic Status	27.67	33.09	28.05	39.98	39.34
Family Structure and Stability	12.20	18.06	18.05	24.10	16.44
Racial-Ethnic Group Membership	68.97	68.58	55.54	59.62	68.71
Achievement	34.04	36.68	35.48	35.63	34.55
Attitude Toward Life	15.89	21.77	13.26	9.10	.....
Expectations for Excellence	6.10	11.00	9.90	15.13	.....
Educational Plans and Desires	10.12	11.26	12.38	9.92	.....
Study Habits	11.31	18.40	15.04	19.41	.....
Number of Schools	780	923	2,372	2,453	1,302
Number of Students	96,409	133,136	123,386	129,774	71,460

The percentages in table 4.2 may also be regarded as indications of the extent to which students who are similar with respect to the variable or attribute under consideration tend to go to school with one another. Thus if there were no association of the attributes of the students with the kinds of schools they attend, then the percentage of total variance associated with the schools would be near zero for that attribute. It will be noted that, as one progresses from the lower to the higher grade levels, there is a slight decrease in the percent of total Socio-Economic Status (SES) variance associated with the schools students attend. This decrease may reflect, in part, the aggregation of students with more heterogeneous backgrounds into larger schools at the 12th-grade level, as well as the loss of the lower SES students as dropouts. A similar trend is observed for Family Structure and Stability, although the percentages here are much lower than for SES.

The percent of total variance in Racial-Ethnic differences that is associated with the schools is very large—almost 69 percent for grades one, nine, and 12; 60 and 56 percent, respectively, for grades three and six. These large percentages indicate that white students tend to go to school with white students and nonwhites to go to school with nonwhite students. The extent of segregation in the public schools in the fall of 1965, as reflected by these percentages, was large both in an absolute and a relative [8] sense. Perhaps the lower percentages at grades three and six represent some attempts at integration.

Another variable or major interest is Achievement. Inspection of the row containing the Achievement values [9] in table 4.2 shows that the percent of total Achievement variance that is associated with differences among the schools remains almost constant over the different grade levels. The slight drop at grade 12 may reflect the loss of the lower achieving dropouts. The other variables (or

[4] Grades 12 and 9 only.
[5] Grades 6, 3, and 1 only.
[6] For the sake of simplicity, considerations of statistical error, though relevant here, have been postponed.
[7] The correction for the appropriate degrees of freedom is a modification of the shrinkage formula for a multiple correlation (for which see Thorndike, 1949, p. 204). To use this formula each school is regarded as a dummy variable where a student is assigned a 1 if he attends that school and 0 otherwise. This results in one dummy variable for each school, and the dependent variable is regressed against the dummy variables. The formula used is:

$$P^2 = 1 - \frac{(N-1)(1-R^2)}{N-p}$$

where
P^2 = the corrected squared multiple correlation
N = the number of students
n = the number of schools
$p = n-1$
R^2 = the ratio of the among school variance (S_A^2) to the total variance (S^2T)
$S_A^2/S^2_T = R^2$

[8] I.e., relative to the other variables under consideration.
[9] The Equality of Educational Opportunity report (Coleman et al., 1966) found that when the racial and ethnic groups were stratified (or kept separate) these values ranged from 5.07 for Oriental-Americans at the 12th grade to 37.92 for Indian-Americans at the 3d grade.

indices) are not represented at the first grade. They tend to show considerable fluctuation in moving from the third to the sixth grades, and higher grade levels. These fluctuations represent in part the smaller number and sometimes different nature of the variables used to represent the indices at the lower grade levels.

4.3. SUMMARY OF CORRELATIONS

Tables 4.3.1–4.3.13 present correlations between a number of variables, some of which are aggregates. As Robinson (1950) has noted, correlations between aggregate measures may often be larger than correlations between observations based upon individuals. Also, the criterion-scaling technique employed here tended to increase the degree of correlation among student body questionnaire items (see appendix XII).

The correlates in question are of:

Rural-Urban Location of School
Size of School
Principal's Training
Pupil-Teacher Ratio
Student Body's Socio-Economic Status
Student Body's Family Structure and Stability
Student Body's Racial-Ethnic Composition
Student Body's Expectations for Excellence
Student Body's Attitude Toward Life
Student Body's Educational Plans and Desires
Student Body's Study Habits
School Achievement Levels
Special 12th-Grade Outcome Measures [10]

In order to keep down the sheer volume of correlations, only those variables that have a correlation of 0.20 or greater for two or more grade levels are presented and discussed. By and large there are few if any surprises among these correlations; they are consistent with current social scientific opinion on the relation between educational factors.

4.3.1. Correlates of Rural-Urban Location

One of the items from the principal questionnaire dealt with whether the school had a rural or an urban location, and of what kind. The variable was coded so that inner-city and suburban schools received a high value and small-town and rural schools received a low value. The selected correlations are given in table 4.3.1.

Inspection of table 4.3.1 shows that the urban schools, when contrasted with the rural schools, have:

Better trained and higher paid principals;
More specialized staff and services, particularly at the higher grade levels;
More frequent use of tracking and ability grouping at the higher grade levels;
Less frequent use of testing at the higher grade levels;

[10] Percent of Graduates Going on to College (both total percent and percent nonwhite), Percent of Graduates Going on to Post-secondary Vocational Training (both total percent and percent nonwhite), and Percent of 10th-Grade Boys Who Drop Out Before Completion of 12th Grade.

Table 4.3.1.—Correlates of Rural-Urban Location

	Grade level				
	1	3	6	9	12
Principal's Training	.47	.47	.46	.44	.43
Specialized Staff and Services	.38	.37	.37	.62	.64
Tracking and Ability Grouping	.07	.06	.06	.21	.27
Student-Testing Program	−.07	−.05	−.07	−.32	−.28
Percent of Students Transferring In and Out	.32	.29	.31	.20	.20
Free Milk and Lunch Programs	−.20	−.21	−.23	−.16	−.16
Pupil/Teacher Ratio	.23	.24	.26	−.01	.12
Number of Hours Homework Expected Per Day	−.34	−.30	−.31	.02	.18
Teacher Tenure	.20	.19	.19	.27	.25
Teacher Examinations	.18	.21	.20	.19	.24
Number of Students Enrolled in School	.37	.39	.40	.55	.68
Scope and Severity of School Problems	.15	.15	.19	.23	.37
Number of Years Since Nonwhites Entered School	.17	.20	.21	.30	.32
Pupils/Room Ratio	.13	.22	.14	.12	.25
Teacher's Experience	−.24	−.19	−.19	−.31	.18
Teacher's Socio-Economic Background	.39	.37	.36	.28	.10
Teacher's Training	.40	.43	.44	.26	.41
Hours Per Day Spent in Teaching	.27	.24	.26	.20	.17
Teacher's Assignment to Present School	−.43	−.34	−.35	−.26	−.36
Teacher's Salary	.42	.43	.44	.35	.39
Student Body's Socio-Economic Status	.10	.15	.24	.35	.27
Student Body's Educational Plans and Desires		.01	.17	.26	.21
Student Body's Kindergarten Attendance	.41	.43	.35	.33	.32

Greater student turnover, both influx and outflow;
A slightly smaller percentage of their students in free milk and lunch programs;
More pupils per teacher at the lower grade levels;
A greater number of students and more pupils per room;
A tenure system, with use of teacher examinations in the placement process;
More problems (destruction of property, stealing, etc.);
Longer experience of nonwhites' presence in the school;
Lower expectations of homework at the lower grade levels (one through six);
Slightly higher expectations of homework at the 12th grade.

Teachers in urban schools, compared with teachers in rural schools tend to:

Be younger and have slightly less teaching experience at grades one through nine;
Have slightly more teaching experience at grade 12;
Have origins in the higher socioeconomic strata, especially at the lower grade levels;
Be more highly trained and have higher salary levels;
Spend more hours in teaching;
Be more likely to have been placed in the school they are now teaching in than to have chosen it.

Students in urban and suburban schools, when compared with students in small-town and rural schools, tend to come from the higher socioeconomic strata and to have a greater desire for more schooling.

4.3.2. Correlates of School Size

Table 4.3.2 gives the correlations with school size (i.e., with the number of students enrolled in the school).

Schools with large numbers of students, when compared with schools with fewer numbers of students, tend to have:

- A larger physical plant;
- A more highly trained and better paid principal;
- More instructional facilities, including more specialized staff and services;
- More tracking and ability grouping, but less testing at the higher grade levels;
- More student turnover, both influx and outflow;
- A higher percentage of their students in remedial reading and math programs at the higher grade levels;
- Predominantly suburban and urban locations;
- More pupils per teacher and more pupils per room;
- A tenure system, with use of teacher examinations in the appointment process:
- More school problems (destruction of property, stealing, etc.), as estimated by the principal;
- Longer experience of nonwhites' presence in the school.

Teachers in large schools, when compared with teachers in smaller schools, tend to be:

- Slightly younger and less experienced at grades one through nine;
- Slightly older and more experienced at grade 12;
- Have origins in the higher socioeconomic strata;
- Have more training and higher salary levels.

Students in large schools, when compared with students in smaller schools, are rather more likely to have parents who speak a foreign language. They are also more likely to have attended kindergarten.

Although the correlations of School Size tend to resemble those of rural-urban location, its moderately high correlations with such expenditure variables as principal's training, teacher's salary, specialized staff and services, and instructional facilities suggest that it may be an important variable for future analyses.

Table 4.3.2.—Correlates of School Size

	Grade level				
	1	3	6	9	12
Plant and Physical Facilities	.31	.33	.30	.22	.15
Principal's Training	.43	.48	.48	.49	.51
Instructional Facilities	.27	.28	.27	.32	.55
Specialized Staff and Services	.50	.50	.51	.69	.75
Tracking and Ability Grouping	.08	.13	.14	.28	.39
Student Testing Program	.07	.07	.05	−.21	−.21
Percent of Students Transferring In and Out	.24	.27	.26	.16	.21
Remedial Mathematics and Reading Classes	.05	.09	.09	.22	.23
Rural-Urban Location of School	.37	.39	.40	.55	.68
Pupil/Teacher Ratio	.28	.30	.32	.18	.34
Teacher Tenure	.08	.10	.11	.21	.23
Teacher Examinations	.14	.16	.15	.25	.20
Scope and Severity of School Problems	.23	.21	.22	.22	.32
Number of Years Since Nonwhites Entered School	.13	.15	.16	.28	.33
Pupils/Room Ratio	.20	.39	.22	.40	.50
Teacher's Experience	−.16	−.17	−.17	−.25	.22
Teacher's Socio-Economic Background	.20	.23	.22	.16	.23
Teacher's Training	.26	.27	.29	.18	.49
Teacher's Salary	.24	.26	.29	.31	.43
Student Body's Kindergarten Attendance	.19	.23	.14	.23	.30
Parent Speaks a Foreign Language at Home	−.02	−.10	−.14	−.20	−.20

4.3.3. Correlates of Pupil-Teacher Ratio

In almost any discussion of school effectiveness the question of an appropriate pupil-teacher ratio arises sooner or later. It is of interest, therefore, to see what other variables are correlated with this ratio. Table 4.3.3 gives such correlations. A high value of the ratio indicates that there are many pupils, a low value that there are fewer pupils per teacher.

Table 4.3.3.—Correlates of Pupil-Teacher Ratio

	Grade level				
	1	3	6	9	12
Instructional Facilities	−0.24	−0.17	−0.17	−0.20	0.01
Rural-Urban Location of School	.23	.24	.26	−.01	.12
Number of Students Enrolled in School	.28	.30	.32	.18	.34
Pupils/Room Ratio	.24	.65	.29	.59	.73
Teacher's Assign. to Present School	−.32	−.25	−.25	−.18	−.22
Student Body's Attitude Toward Life		−.07	−.09	−.26	−.24
Student Body's Achievement Level	−.14	−.11	−.12	−.34	−.21

Schools with a high ratio, when compared with schools that have a low ratio, tend to have:

- Fewer instructional facilities;
- A more urban or suburban location at the lower grade levels (but less so at grades nine and 12);
- More students enrolled and more pupils per room;
- Teachers who are less likely to have chosen the school they are now in than to have been assigned to it;
- Students who have a less favorable attitude toward life at the higher grades;
- Students who have lower achievement levels at all grades.

4.3.4. Correlates of Principal's Training

The index called Principal's Training is a combination of the principal's training and his highest degree held. This index is one measure of the magnitude of a school's budget, since the more affluent schools tend to have higher paid and better trained principals. Table 4.3.4. gives the correlates of Principal's Training.

Inspection of table 4.3.4 shows that the schools with principals who have better pay and higher degrees are the same schools that tend to have:

- A larger physical plant;
- More instructional facilities, including more specialized staff and services;
- More tracking, but less testing (at grades nine and 12);
- More student transfers;

Table 4.3.4.—Correlates of Principal's Training

	Grade level				
	1	3	6	9	12
Plant and Physical Facilities	0.25	0.25	0.24	0.13	0.10
Instructional Facilities	.15	.17	.18	.23	.50
Specialized Staff and Services	.55	.53	.54	.65	.62
Tracking and Ability Grouping	.06	.09	.10	.24	.25
Pupil Assignment	.20	.20	.20	.24	−.14
Student Testing Program	.00	.01	.02	−.22	−.32
Percent of Students Transferring In and Out	.28	.29	.27	.23	.12
Remedial Mathematics and Reading Classes	.12	.18	.18	.24	.22
Rural-Urban Location of School	.47	.47	.46	.44	.43
Compulsory Attendance Law	.22	.19	.20	.21	.08
Teacher Tenure	.29	.31	.31	.36	.27
Number of Students Enrolled in School	.44	.48	.48	.49	.51
Number of Years Since Nonwhites Entered School	.28	.27	.28	.34	.33
Principal's Sex	−.25	−.23	−.20	−.10	−.22
Principal's Credits Beyond Highest Degree	.09	.12	.12	.20	.26
Teacher's Experience	−.21	−.22	−.22	−.20	.20
Teacher's Socio-Economic Background	.31	.39	.36	.31	.31
Teacher's Training	.54	.58	.58	.42	.55
Teacher's College Attended	.28	.30	.29	.22	.03
Preference for High-Ability Students	.18	.21	.20	.21	.13
Teacher's Sex	−.29	−.20	−.17	−.28	.01
Hours Per Day Spent in Teaching	.28	.27	.29	.20	.14
Teacher's Credits Beyond Highest Degree	.15	.18	.19	.40	.30
Teacher's Assign. to Present School	−.26	−.19	−.19	−.26	−.26
Teacher's Salary	.60	.63	.62	.58	.58
Teacher's Vocabulary Score	.21	.23	.23	.19	.17
Student Body's Socio-Economic Status	.17	.19	.26	.31	.21
Student Body's Kindergarten Attendance	.39	.46	.37	.35	.24

A greater percentage of students in remedial reading and math courses;
A more urban location;
More students;
A male principal;
Longer experience of nonwhites' presence in the school; A teacher tenure system;
A compulsory school law that is enforced;
Enrollment restricted to students from their particular geographic attendance area, except at grade 12;
Principals who have taken course work beyond their highest degree.

Teachers in schools that rank high on Principal's Training tend to be:

Younger and less experienced, except for grade 12;
Of higher socioeconomic origins;
Better trained and better paid;
Graduates of a college that offered an advanced degree and that, in their opinion, had a high academic standing;
Male;
High scorers on the vocabulary test;
Engaged in teaching for more hours per day;
Holders of credits beyond their highest degree;
Less likely to have chosen the school they are now in as a place to work.

Students in schools that rank high on Principal's Training tend to come from the higher socioeconomic strata and are more likely to have attended kindergarten.

4.3.5. Correlates of the Student Body's Socio-Economic Status

The extent to which school attributes are related to students' Socio-Economic Status may indicate the way in which school resources are allocated, both purposely and unintentionally, along socioeconomic lines. Table 4.3.5 presents these correlations. A high scoring school has a high proportion of students whose parents come from the higher educational and occupational strata, who live in a six- to 10-room house that contains a large number of appliances and reading materials, and who have one or two siblings. A low-scoring school has many students whose parents come from the lower educational and occupational strata, and who have many siblings.

Comparison of schools that have students of predominantly high socioeconomic status with those that have students of predominantly low socioeconomic status shows that they tend to have:

Principals who are better trained and better paid;
More specialized staff and services;
A smaller percentage of students in free milk and lunch programs;
State and regional accreditation;

Table 4.3.5.—Correlates of the Student Body's Socio-Economic Status

	Grade level				
	1	3	6	9	12
Principal's Training	0.17	0.19	0.26	0.31	0.21
Specialized Staff and Services	.25	.29	.30	.45	.42
Pupil Assignment	.18	.19	.22	.28	.15
Free Milk and Lunch Programs	−.22	−.22	−.28	−.31	−.14
Accreditation of School	.14	.21	.22	.13	.27
Rural-Urban Location of School	.10	.15	.24	.35	.27
Parent-Teacher Association	.18	.21	.20	.07	−.03
Compulsory Attendance Law	.29	.30	.32	.34	.21
Daily Attendance	.30	.30	.32	.38	.17
Socio-Economic Status	.40	.47	.53	.45	.45
Principal's Estimate of School Reputation	.23	.30	.34	.34	.32
Teaching Conditions	.58	.64	.61	.48	.49
Teacher's Socio-Economic Background	.30	.35	.41	.40	.32
Teacher's Training	.16	.20	.26	.22	.21
Teacher's College Attended	.27	.25	.28	.32	.28
Preference for High-Ability Students	.35	.37	.42	.35	.38
Hours Per Day Spent in Teaching	.13	.15	.21	.20	−.12
Teacher's Racial-Ethnic Group Membership	.54	.55	.57	.57	.57
Percent White Students at Teacher's Undergraduate Institution	.51	.52	.54	.47	.56
Teacher's Salary	.23	.27	.33	.31	.41
Percent White Students in Teacher's Class	.57	.62	.61	.54	.57
Teacher's Vocabulary Score	.46	.48	.54	.48	.59
Student Body's Expectations for Excellence		.28	.48	.47	−.15
Student Body's Attitude Toward Life		.20	.58	.60	.44
Student Body's Family Structure and Stability	.44	.48	.60	.67	.53
Student Body's Educational Plans and Desires		.35	.64	.69	.49
Student Body's Study Habits		.60	.60	.57	.34
Student Body's Achievement Level	.61	.68	.82	.82	.81
Student Body's Racial-Ethnic Composition	.60	.65	.67	.68	.59
Student Body's Kindergarten Attendance	.37	.42	.56	.62	.50
Nursery School Attendance	.32	.20	.45		
Student Speaks a Foreign Language at Home	.17	.30	.39	.58	.44
Parent Speaks a Foreign Language at Home	.18	.30	.39	.38	.14

A more urban location, particularly at the higher grade levels;
A good reputation among other educators in the area, as estimated by the principal;
A high percent of parental attendance at PTA meetings, at the lower grade levels;
A compulsory school law that is enforced;
Enrollment restricted to students from their particular geographic attendance area, with few or no transfers;
A high percent of students in daily attendance.

The *variable* entitled "Socio-Economic Status" is actually a description of the occupational background of the pupil's parents (the information was given by the principal). Since this variable might be regarded as an indicator of the student body's socioeconomic status it is of interest to note that it is only moderately (0.40 to 0.53) correlated with the index of that name. Hence, if it were used to equate schools for differences in the SES of their students before the relationships of other school variables had been taken into account, the differences would be underestimated, and erroneous inferences could be made concerning the influences of certain school variables.

Table 4.3.5 also shows that teachers in schools with a high SES index value, compared with teachers in schools with a low SES index value, feel that:

They have better working conditions (greater amount of effort put forth by students, fewer disciplinary and racial problems, etc.);
They have higher socioeconomic origins, more training and higher salary levels;
They went to an undergraduate institution that offered an advanced degree, and thought it had a high academic standing;
They preferred to teach high-ability students.

They were also more likely to have higher vocabulary test scores, to have attended predominantly white undergraduate institutions, to have mainly white students in their classes, and (except at the 12th grade) to spend more hours in classroom teaching.

Students in schools with a high SES index value tend to have:

A more stable family structure;
Higher expectations (except at the 12th grade);
A greater desire to stay on in school;
More studious habits and a more favorable attitude toward life;
Very much higher achievement levels, particularly at the higher grades.

They are also more likely to be white, to have attended kindergarten and nursery school, and to speak English at home and outside of school.

4.3.6. Correlates of the Student Body's Family Structure and Stability

The presence or absence of a parent or parental substitute in the home makes all the difference to socialization. This is an important educational fact. A child's degree of socialization—his readiness for learning, feelings of acceptance or rejection, etc.—is bound to influence the functioning of his school.

Table 4.3.6 presents correlates of the Family Structure index. A child that scores high on this index has both parents in the home, a mother who works either not at all or only part time, and has not changed schools recently. A school that scores high on this index has a relatively greater proportion of such children.

When schools that score high on the Family Structure index are compared with lower scoring schools we find that they have fewer school problems, a high percentage of students in daily attendance, and a compulsory school law that is enforced. Teachers in high-scoring schools, in contrast to teachers in low-scoring schools tend to feel that:

The students try hard to achieve and are of high academic ability;
There are few school problems;
Their undergraduate institution (which offered an advanced degree) had a high academic standing;
They prefer to teach high-ability students.

They are also slightly less involved in teaching-related activities (time spent in preparation for class and counseling, reading educational journals, etc.), are more likely to be white, have higher vocabulary scores, attended predominantly white undergraduate institutions, and have a high percent of white students in their classes.

Table 4.3.6.—Correlates of the Student Body's Family Structure and Stability

	Grade level				
	1	3	6	9	12
Compulsory Attendance Law	0.25	0.20	0.25	0.25	0.08
Scope and Severity of School Problems	−.22	−.14	−.18	−.15	−.31
Daily Attendance	.24	.21	.30	.42	.34
Teaching Conditions	.40	.35	.42	.39	.43
Teacher's College Attended	.20	.14	.18	.19	.26
Teaching-Related Activities	−.16	−.18	−.20	−.19	−.22
Preference for High-Ability Students	.27	.21	.26	.21	.22
Teacher's Racial-Ethnic Group Membership	.58	.48	.60	.55	.57
Percent White Students at Teacher's Undergraduate Institution	.55	.47	.58	.47	.58
Percent White Students in Teacher's Class	.59	.51	.62	.55	.60
Teacher's Vocabulary Score	.41	.35	.43	.35	.39
Student Body's Expectations for Excellence		.47	.67	.66	−.03
Student Body's Socio-Economic Status	.44	.48	.60	.67	.53
Student Body's Attitude Toward Life		.46	.73	.75	.67
Student Body's Educational Plans and Desires		.39	.61	.56	.28
Student Body's Study Habits		.60	.72	.82	.56
Student Body's Achievement Level	.37	.46	.67	.66	.63
Proportion of Females in Student Body	−.20	.44	.38	.63	.54
Student Body's Racial-Ethnic Composition	.59	.58	.66	.70	.59
Student Body's Parental PTA Attendance				.62	.44
Student Body's Kindergarten Attendance	.21	.23	.44	.47	.16
Nursery School Attendance	.18	.27	.71		
Student Speaks a Foreign Language at Home	.06	.51	.55	.73	.35
Parent Speaks a Foreign Language at Home	.11	.48	.60	.64	.26

Students who attend schools that score high on this index tend to:

Come from higher socioeconomic strata;
Have higher expectations, a greater desire to stay on in school, more studious habits, a more favorable outlook on life, and higher achievement levels;
Be female (except at the first grade) and white;
Speak English at home as well as with other students outside of school;
Have attended kindergarten and nursery school;
Have parents who attend PTA meetings frequently.

4.3.7. Correlates of the Student Body's Racial and Ethnic Composition

A school that scores high on Racial-Ethnic Composition has predominantly white and Oriental-American students, whereas a school that scores low has predominantly Negro, Mexican-American, Puerto Rican or Indian-American students. When high-ranking schools are compared with low-ranking schools we note that they tend to:

Have a good reputation (as estimated by the principal) among other educators in the area;
Make less use of teacher examinations in the appointment process;
Have fewer school problems (destruction of property, stealing, racial tension, etc.);
Have a compulsory school law that is enforced;
Have a high percent of students in daily attendance.

The correlations are given in table 4.3.7.

The variable entitled "Proportion of White Students in School" is based on information given by the principal, not on an actual count of the students at different grade levels. It is of interest to note that this variable is highly correlated with Racial and Ethnic Composition. Evidently the racial mix of a school tends to predominate at all grade levels. It also seems that, for research purposes, an estimate of a school's racial mix by the principal may serve as a fairly good surrogate for an actual count of whites and nonwhites.

The teachers in predominantly white schools, when compared with their counterparts in nonwhite schools, tend to:

Feel that the students try hard to achieve and are of higher academic ability;
Have origins in the higher socioeconomic strata;
Have graduated from a college that offered an advanced degree and that they felt had a high academic standing; Be less involved in teaching-related activities (classroom preparation and counseling, reading educational journals, etc.);
Prefer to teach high-ability students;
Be white;
Have higher vocabulary scores;
Have attended a predominantly white undergraduate institution;
Have a high percent of white students in their classes;
Have chosen the present school they are teaching in rather than to have been assigned to it.

The students in predominantly white schools, when compared with the students in predominantly nonwhite schools, tend to:

Come from the upper socioeconomic strata;
Have a more stable family structure;
Have higher expectations and a greater desire to stay on in school (except at grade 12);
Have more studious habits and a more favorable outlook on life;
Have very much higher achievement levels, particularly at the higher grades;
Have a higher proportion of girls;
Speak English at home and outside school;
Have attended kindergarten.

Table 4.3.7.—Correlates of the Student Body's Racial and Ethnic Composition

	Grade level				
	1	3	6	9	12
Compulsory Attendance Law	0.29	0.28	0.27	0.30	0.28
Teacher Examinations	−.23	−.23	−.22	−.13	−.17
Proportion of White Students in School	.88	.87	.88	.77	.91
Scope and Severity of School Problems	−.24	−.21	−.24	−.22	−.25
Daily Attendance	.30	.34	.36	.46	.35
Principal's Estimate of School Reputation	.17	.18	.23	.23	.15
Teaching Conditions	.50	.53	.54	.46	.37
Teacher's Socio-Economic Background	.24	.22	.22	.24	.32
Teacher's College Attended	.29	.23	.23	.28	.35
Teaching-Related Activities	−.28	−.28	−.27	−.35	−.38
Preference for High-Ability Students	.38	.37	.36	.33	.33
Teacher's Racial-Ethnic Group Membership	.88	.85	.85	.89	.93
Teacher's Assignment to Present School	.15	.16	.15	.27	.38
Percent White Students at Teacher's Undergraduate Institution	.85	.82	.82	.77	.93
Percent White Students in Teacher's Class	.92	.92	.93	.81	.95
Teacher's Vocabulary Score	.58	.55	.55	.54	.68
Student Body's Expectations for Excellence		.23	.46	.29	−.38
Student Body's Socio-Economic Status	.60	.65	.67	.68	.59
Student Body's Attitude Toward Life		.22	.51	.60	.54
Student Body's Family Structure and Stability	.59	.58	.66	.70	.59
Student Body's Educational Plans and Desires		.31	.45	.29	−.05
Student Body's Study Habits		.53	.47	.43	.11
Student Body's Achievement Level	.56	.63	.80	.84	.80
Proprotion of Females in Student Body	.03	.14	.09	.27	.22
Student Body's Kindergarten Attendance	.23	.22	.31	.28	.21
Student speaks a Foreign Language at Home	.10	.31	.48	.39	.16
Parent Speaks a Foreign Language at Home	.10	.30	.33	.29	.09

4.3.8. Correlates of the Student Body's Expectations for Excellence

A student with a high score on the index called Expectations for Excellence believes that his mother, father, and teacher want him to be a good student. He also desires to be a good student. A student with a low score does not believe that people have these expectations of him, nor does he hold such expectations for himself. A school with a high score has a greater proportion of high-scoring students, while a school with a low score has a greater proportion of low-scoring students. The correlations are given in table 4.3.8.

Table 4.3.8.—Correlates of the Student Body's Expectations for Excellence

	Grade level			
	1	3	6	9	12
Daily Attendance		0.09	0.25	0.26	−0.06
Teaching Conditions		.15	.28	.30	−.04
Teacher's Racial-Ethnic Group Membership		.18	.40	.12	−.37
Percent White Student at Teacher's Undergrad Institution		.19	.39	.12	−.35
Percent White Students in Teacher's Class		.20	.42	.29	−.32
Teacher's Vocabulary Score		.16	.29	.09	−.32
Student Body's Socio-Economic Status		.28	.48	.47	−.15
Student Body's Attitude Toward Life		.51	.77	.72	.09
Student Body's Family Structure and Stability		.47	.67	.66	−.03
Student Body's Educational Plans and Desires		.51	.72	.69	.45
Student Body's Study Habits		.52	.76	.82	.39
Student Body's Achievement Level		.25	.50	.31	−.23
Proportion of Females in Student Body		.41	.32	.53	.08
Student Body's Racial-Ethnic Composition		.23	.46	.29	−.38
Student Body's Kindergarten Attendance		.22	.45	.32	−.21
Nursery School Attendance		.39	.73		
Student Speaks a Foreign Language at Home		.40	.49	.67	.19
Parent Speaks a Foreign Language at Home		.37	.53	.66	.28

When schools are compared on this index we find that there is virtually no information from the principal's questionnaire that relates to Expectations at the different grade levels.[11] The only exception is for the percent of students in daily attendance, which is higher for high-scoring schools at grades six and nine.

When teachers in high-scoring schools are compared with teachers in low-scoring schools we find they tend to:

Feel that the students put forth more effort to achieve and are of a higher academic ability;
Be white;
Have higher vocabulary scores;
Have graduated from a predominantly white undergraduate institution;
Have a high percent of white students in their classes.

All of the above summary statements must be qualified to read "except at grade 12." This is a subject to which we shall return.

Comparison of students in high- and low-scoring schools shows that the high-scoring students tend to:

Come from the higher socioeconomic strata;
Have a more closely knit family structure;
Have a more favorable outlook on life and higher achievement levels;
Be female;
Be white;
Have attended kindergarten (and nursery school).

Once again, all of these summary statements must be qualified to read "except at grade 12." On the other hand, for all four grade levels [12] students in high-scoring schools have more studious habits and a greater desire to stay on in school. Evidently at the 12th grade there is a dramatic change in the Expectations of nonwhite students.[13] This has the effect of making all variables that have a substantial relationship with Expectations, particularly race-related variables such as teacher's race, to reverse their relationships.

[11] That is, no information by the standards we have established (correlations for 2 grade levels must be 0.20 or greater).

[12] Measures of this index were not available at the 1st grade.

4.3.9. Correlates of the Student Body's Attitude Toward Life

A student with a high score on the index called "Attitude Toward Life" believes that people like himself have a chance to be successful. When he tries to get ahead, he thinks he won't experience many obstacles; hard work is more important than good luck for success. A school with a high score on this index has proportionately more students who have this favorable outlook on life; a school with a low score has proportionately fewer of them. Correlations of the other variables with this index are given in table 4.3.9.

When the high-scoring schools are compared with the low-scoring schools we find that they have fewer pupils per teacher, fewer pupils per room, a compulsory school law that is enforced, and a high percentage of students in daily attendance. The teachers in high-scoring schools, when compared with their counterparts in low-scoring schools, tend to:

Feel that the students put forth more effort and are of a higher academic ability;
Prefer to teach high-ability students;

Table 4.3.9.—Correlates of the Student Body's Attitude Toward Life

	Grade level			
	1	3	6	9	12
Compulsory Attendance Law		0.06	0.22	0.25	0.13
Pupil/Teacher Ratio		−.07	−.09	−.26	−.24
Daily Attendance		.09	.24	.38	.34
Pupils/Room Ratio		−.08	−.04	−.26	−.23
Teaching Conditions		.15	.33	.35	.36
Preference for High-Ability Students		.04	.24	.22	.26
Teacher's Racial-Ethnic Group Membership		.11	.48	.47	.52
Percent White Student at Teacher's Undergrad Institution		.11	.46	.40	.54
Percent White Students in Teacher's Class		.17	.48	.45	.55
Teacher's Vocabulary Score		.08	.40	.34	.38
Student Body's Expectations for Excellence		.51	.77	.72	.09
Student Body's Socio-Economic Status		.20	.58	.60	.44
Student Body's Family Structure and Stability		.46	.73	.75	.67
Student Body's Educational Plans and Desires		.41	.73	.63	.32
Student Body's Study Habits		.41	.86	.79	.58
Student Body's Achievement Level		.22	.60	.64	.62
Proportion of Females in Student Body		.40	.37	.47	.33
Student Body's Racial-Ethnic Composition		.22	.51	.60	.54
Student Body's Parental PTA Attendance				.52	.33
Student Body's Kindergarten Attendance		.06	.56	.42	.09
Nursery School Attendance		.25	.80		
Student Speaks a Foreign Language at Home		.45	.49	.60	.35
Parent Speaks a Foreign Language at Home		.42	.58	.53	.26

[13] The loss of nonwhite dropouts probably has some part in this.

Be white;
Have higher vocabulary scores;
Have graduated from predominantly white undergraduate institutions;
Have a large percentage of white students in their classes.

Students in schools with high rankings, when compared with students in low-ranking schools, tend to:

Come from the higher socioeconomic strata;
Have a more favorable family structure;
Have higher expectations, a greater desire to stay on in school and more studious habits;
Have higher achievement levels;
Have higher proportions of girls and white students as schoolmates;
Speak English both at home and outside school;
Have attended kindergarten and nursery school;
Have parents who attend PTA meetings frequently.

4.3.10. Correlates of the Student Body's Educational Plans and Desires

A school with a high score on the index called Educational Plans and Desires has many students who desire and plan to go to college, whose parents want them to go to college, and who have high occupational aspirations. A low-scoring school has a smaller proportion of students with these kinds of aspirations. Table 4.3.10 gives the correlations of other variables with this index.

Inspection of table 4.3.10 shows that high-scoring schools, when compared with low-scoring schools, tend to have:

More specialized staff and services;
A somewhat more urban location;
A better reputation among other educators in the area (as estimated by the principal);
A high percent of students in daily attendance.

When teachers in high-scoring schools are compared with their counterparts in low-scoring schools we find that they tend to:

Feel that the students put forth more effort and are of a higher academic ability;
Have origins in the higher socioeconomic strata (except at grade 12);
Prefer to teach high-ability students;
Be white;
Have higher vocabulary scores (except at grade 12);
Have attended a predominantly white undergraduate institution;
Have a high percentage of white students in their classes (except at grade 12).

Students in high-scoring schools tend to:

Come from the higher socioeconomic strata;
Have a more favorable family structure;
Have higher expectations, more studious habits and a more favorable outlook on life;
Have higher achievement levels;
Have a higher proportion of female students as schoolmates;
Be white (except at grade 12);
Speak English at home and out of school;
Have attended kindergarten and nursery school.

Table 4.3.10.—Correlates of the Student Body's Educational Plans and Desires

	Grade level			
	1	3	6	9	12
Specialized Staff and Services		0.10	0.20	0.25	0.15
Rural-Urban Location of School		.01	.17	.26	.21
Daily Attendance		.15	.25	.28	.04
Principal's Estimate of School Reputation		.14	.23	.25	.17
Teaching Conditions		.28	.41	.40	.39
Teacher's Socio-Economic Background		.08	.26	.20	−.03
Preference for High-Ability Students		.17	.27	.22	.33
Teacher's Racial-Ethnic Group Membership		.28	.40	.21	−.04
Percent White Student at Teacher's Undergraduate Institution		.26	.38	.19	−.03
Percent White Students in Teacher's Class		.31	.39	.24	−.03
Teacher's Vocabulary Score		.22	.40	.23	.03
Student Body's Expectations for Excellence		.51	.72	.69	.45
Student Body's Socio-Economic Status		.35	.64	.69	.49
Student Body's Attitude Toward Life		.41	.73	.63	.32
Student Body's Family Structure and Stability		.39	.61	.56	.28
Student Body's Study Habits		.48	.77	.68	.43
Student Body's Achievement Level		.36	.64	.50	.34
Proportion of Females in Student Body		.25	.30	.41	.15
Student Body's Racial-Ethnic Composition		.31	.45	.29	−.05
Student Body's Kindergarten Attendance		.23	.57	.53	.13
Nursery School Attendance		.25	.65		
Student Speaks a Foreign Language at Home		.31	.40	.56	.31
Parent Speaks a Foreign Language at Home		.30	.42	.41	.14

4.3.11. Correlates of the Student Body's Study Habits

A school with a high score on Study Habits has proportionately many students who tend to:

Have frequent discussions with their parents about their school work;
Were read to as children before they started school;
Read many books during the summer.

A school with a low score has a higher proportion of students who either do not or did not engage in these kinds of activities (see table 4.3.11).

When high-scoring schools are compared with low-scoring schools, we note that the only variables from the principal's questionnaire that have a relationship with Study Habits are the enforcement of a compulsory school law (except at the 12th grade), and a high percent of students in daily attendance. The teachers in high-scoring schools, when compared with their counterparts in low-scoring schools, tend to:

Feel that they have better teaching conditions;
Prefer to teach high-ability students;
Be white;
Have higher vocabulary scores;

Table 4.3.11.—Correlates of the Student Body's Study Habits

	Grade level			
	1	3	6	9	12
Compulsory Attendance Law	0.27	0.21	0.15	−0.03
Daily Attendance	.22	.21	.30	.21
Teaching Conditions	.39	.34	.30	.20
Preference for High-Ability Students	.30	.26	.16	.16
Teacher's Racial-Ethnic Group Membership	.48	.42	.29	.14
Percent White Student at Teacher's Undergraduate Institution	.48	.39	.29	.15
Percent White Students in Teacher's Class	.49	.43	.37	.13
Teacher's Vocabulary Score	.43	.39	.24	.14
Student Body's Expectations for Excellence	.52	.76	.82	.39
Student Body's Socio-Economic Status	.60	.60	.57	.34
Student Body's Attitude Toward Life	.41	.86	.79	.58
Student Body's Family Structure and Stability	.60	.72	.82	.56
Student Body's Educational Plans and Desires	.48	.77	.68	.43
Student Body's Achievement Level	.52	.59	.46	.22
Proportion of Females in Student Body	.40	.39	.65	.53
Student Body's Racial-Ethnic Composition	.53	.47	.43	.11
Student Body's Parental PTA Attendance			.74	.33
Student Body's Kindergarten Attendance	.42	.59	.52	.10
Nursery School Attendance	.29	.77		
Student Speaks a Foreign Language ar Home	.48	.48	.76	.52
Parent Speaks a Foreign Language at Home	.44	.56	.67	.44
Student Body's Parental PTA Attendance			.74	.33

Have graduated from a predominantly white undergraduate institution and have a high percentage of white students in their classes.

Students in high-scoring schools, when compared with students in low-scoring schools, tend to:

Come from the higher socioeconomic strata;
Have a more favorable family structure;
Have higher expectations and desire to stay in school longer;
Have a more favorable outlook on life, including higher achievement levels;
Be predominantly female;
Be white;
Speak English at home and outside of school;
Have attended kindergarten and nursery school;
Have parents who attend PTA meetings frequently.

4.3.12. Correlates of School-Achievement Levels

Since the student's Achievement composite is one of the primary dependent variables in these analyses it will be helpful at this stage to scrutinize the kinds of variables with which it is correlated. Table 4.3.12 presents these correlations.[14]

[14] A school that scores high on this index has a high proportion of students with high scores on the Achievement composite for their grade level; a school that scores low has a high proportion of students with low scores.

When schools with high-achievement levels are compared with schools with low-achievement levels we note that they have:

More specialized staff and services;
Textbooks available in sufficient number;
Fewer pupils per teacher;
A good reputation among other educators in the area (as estimated by the principal);
Fewer school problems (stealing, property destruction, racial tension, etc.);
A compulsory school law that is enforced;
A high percent of students in daily attendance;
Enrollment restricted to pupils from the same geographic attendance area, with few or no transfers.

Teachers in schools with high-achievement levels, when compared with teachers in lower scoring schools, tend to:

Believe they have more desirable working conditions (the students put forth more effort, are of a higher academic ability, and create fewer problems, etc.);
Have origins in the higher socioeconomic strata;
Have graduated from a college that offered an advanced degree and that they felt had a high academic standing; Be less involved in teaching related

Table 4.3.12.—Correlates of School-Achievement Levels

	Grade level				
	1	3	6	9	12
Specialized Staff and Services	0.16	0.20	0.20	0.31	0.21
Pupil Assignment	.16	.16	.21	.21	.12
Availability of Texts	.16	.14	.19	.21	.22
Compulsory Attendance Law	.30	.27	.34	.40	.27
Pupil/Teacher Ratio	−.14	−.11	−.12	−.34	−.21
Teacher Examinations	−.22	−.17	−.21	−.14	−.18
Scope and Severity of School Problems	−.22	−.17	−.19	−.22	−.20
Daily Attendance	.31	.31	.36	.43	.27
Principal's Estimate of School Reputation	.18	.25	.28	.27	.24
Teaching Conditions	.50	.55	.59	.47	.53
Teacher's Socio-Economic Background	.13	.20	.29	.33	.27
Teacher's College Attended	.17	.19	.29	.31	.33
Teaching-Related Activities	−.16	−.14	−.18	−.30	−.23
Preference for High-Ability Students	.29	.32	.38	.32	.40
Teacher's Racial-Ethnic Group Membership	.52	.53	.73	.77	.75
Percent White Student at Teacher's Undergraduate Institutions	.49	.51	.70	.76	.76
Teacher's Salary	.16	.19	.27	.24	.36
Percent White Students in Teacher's Class	.56	.58	.73	.75	.78
Teacher's Vocabulary Score	.44	.47	.62	.58	.65
Student Body's Expectations for Excellence		.25	.50	.31	−.23
Student Body's Socio-Economic Status	.61	.68	.82	.82	.81
Student Body's Attitude Toward Life		.22	.60	.64	.62
Student Body's Family Structure and Stability	.37	.46	.67	.66	.63
Student Body's Educational Plans and Desires		.36	.64	.50	.34
Student Body's Study Habits		.52	.59	.46	.22
Proportion of Females in Student Body	.04	.12	.14	.28	.22
Student Body's Racial-Ethnic Composition	.56	.63	.80	.84	.80
Student Body's Kindergarten Attendance	.33	.33	.49	.46	.40
Student Speaks a Foreign Language at Home	.08	.28	.42	.43	.33
Parent Speaks a Foreign Language at Home	.07	.27	.39	.23	.09

activities (time spent in preparation for class and counseling, reading educational journals, etc.);
Prefer to teach high-ability students;
Be white;
Have higher salary levels;
Have higher vocabulary test scores;
Have attended a predominantly white undergraduate institution;
Have a high percentage of white students in their classes.

Students in schools with high-achievement levels, when compared with students in low-achieving schools, tend to:

Come from the higher socioeconomic strata;
Have a more favorable family structure;
Have higher expectations (except at the 12th grade);
Desire to stay in school longer;
Have more studious habits and a more favorable outlook on life;
Have a higher proportion of females as schoolmates;
Be white;
Have attended kindergarten;
Speak English at home and outside of school.

4.3.13. Correlates of the Special 12th-Grade Outcome Measures

Table 4.3.13 presents the correlations of Percent of 12th-Grade Students Going on to College, Percent of 12th-Grade Nonwhite Students Going on to College, Percent of 12-Grade Students Going on to Postsecondary Vocational Training (secretarial school, beautician's training, etc.), Percent of 12-Grade Nonwhite Students Going on to Postsecondary Vocational Training, and Percent of Boy Dropouts (i.e., the percent of boys who drop out of school after entering the 10th grade but before completing the 12th grade).

Information on these topics was provided by the principals of the 12th-grade schools. The variables, then, pertain to the student body of each 12th-grade school as seen by the principal, not to a count of individual students. Variables that did not have a correlational value of 0.20 or greater with at least one of these outcome measures were eliminated.[18] For the most part, we discuss only correlations of 0.20 or greater. All outcome measures are scored or coded so that a high value indicates a high percentage.

Percent of 12th-Grade Students Going on to College.—Schools that have a higher percent of students going on to college, when compared to schools that have a lower percent, tend also to have:

A larger physical plant;
More instructional facilities;
More specialized staff and services;
Fewer boy and girl dropouts;
A better reputation, as estimated by the principal;
A greater amount of homework;

[18] Percent of Girl Dropouts was not included because it was so highly correlated (0.87) with Percent of Boy Dropouts.

Table 4.3.13.—Correlates of the Special 12th-Grade Outcome Measures

	PTO COL	PNT COL	PTO VOC	PNT VOC	PB DROP
Plant and Physical Facilities	0.25	−0.01	0.14	−0.04	−0.07
Instructional Facilities	.23	.08	.23	−.02	.04
Specialized Staff and Services	.17	.13	.20	.08	.17
Tracking and Ability Grouping	−.08	.15	.19	.09	.21
Availability of Texts	.15	−.13	−.12	−.11	−.21
Percent White Entering Vocational School	−.04	.01	1.00	.18	.02
Rural-Urban Location of School	.11	.09	.01	.10	.25
Percent Entering College	1.00	.11	−.04	.04	−.26
Percent Nonwhite Entering College	.11	1.00	.01	.51	.12
Percent Nonwhite Entering Vocational Training	.04	.51	.18	1.00	.15
Percent of Girl Dropouts	−.24	.07	−.03	.11	.87
Pupil/Teacher Ratio	−.13	.09	.20	.12	.19
Number of Hours Homework Expected Per Day	.21	.05	−.05	−.11	−.04
Teacher Examinations	−.05	.00	−.05	.06	.20
Number of Students Enrolled in School	.06	.16	.16	.16	.20
Scope and Severity of School Problems	−.10	.16	−.07	.11	.28
Daily Attendance	.16	−.03	−.03	−.03	−.28
Number of Years Since Nonwhites Entered School	.12	.24	.03	.13	.12
Age of Building	.07	−.22	−.05	−.13	−.03
Principal's Estimate of School Reputation	.24	.11	.07	.05	−.03
Percent of Boy Dropouts	−.25	.12	.02	.15	1.00
Teaching Conditions	.57	−.02	.13	.02	−.28
Localism of Teacher's Background	.23	−.06	−.09	−.10	−.19
Teacher's Training	.07	.21	.09	.03	.08
Preference for High-Ability Students	.40	−.05	.03	−.15	−.23
Teacher's Racial-Ethnic Group Membership	.31	−.14	.10	−.16	−.23
Teacher's Assignment to Present School	.19	−.23	.04	−.11	−.26
Percent White Student at Teacher's Undergraduate Institutions	.30	−.14	.08	−.14	−.18
Percent White Students in Teacher's Class	.31	−.22	.08	−.21	−.32
Teacher's Vocabulary Score	.32	−.13	.07	−.19	−.19
Student Body's Socio-Economic Status	.61	−.07	.12	−.13	−.23
Student Body's Attitude Toward Life	.36	−.07	.01	−.12	−.31
Student Body's Family Structure and Stability	.34	−.10	.10	−.06	−.27
Student Body's Educational Plans and Desires	.60	.08	−.03	.01	−.14
Student Body's Study Habits	.25	.00	−.04	−.07	−.16
Student Body's Achievement Level	.56	−.13	.11	−.14	−.30
Student Body's Racial-Ethnic Composition	.30	−.21	.11	−.20	−.30

More favorable teaching conditions, as viewed by the teachers;
More cosmopolitan teachers (viz, they have experienced more geographic mobility in obtaining their education);
Teachers who prefer high-ability students.

The teachers in these schools tend to be white, to have gone to predominantly white undergraduate institutions, and to teach mainly white students of higher socioeconomic status who have a favorable attitude toward life and a family structure that is positively related to achievement. The same schools also tend to have a high proportion of students who are interested in further education, are more studious, have higher achievement levels, and tend to be white.

Percent of 12th-Grade Nonwhite Students Going on to College.—Schools that have a higher percent of nonwhite students going on to college tend also to have a higher percent of students going on to postsecondary vocational training. There is a *slight* tendency for these

schools to have newer buildings, to have been integrated longer, to have better trained teachers who attended predominantly nonwhite undergraduate institutions and were assigned to their present school (rather than having elected to teach in the school). They also tend to have predominantly nonwhite students.

Percent of 12th-Grade Students Going on to Postsecondary Vocational Training.—Schools with a high percent of 12th-grade graduates going on to some form of vocational training tend to have more instructional facilities, more specialized staff and services, and more pupils per teacher. They also tend to practice tracking. Some of these relationships may be explained by the fact that larger schools tend to have vocational programs. Such programs require more specialized facilities and services. It also seems likely that participation in these programs may encourage students to pursue further work at the postsecondary level.

Percent of 12th-Grade Nonwhite Students Going on to Postsecondary Vocational Training.—Schools with a high percent of nonwhite graduates going on to postsecondary vocational training also tend to have a high percent of nonwhite graduates going on to college, teachers who scored lower on the vocabulary test and attended predominantly nonwhite undergraduate institutions, and a higher proportion of nonwhites in the student body.

Percent of Boy Dropouts.—Since schools that have a high percent of boy dropouts also have a high percent of girl dropouts, this variable can be regarded as representing the percent of all students who drop out before completing the 12th grade.

Schools that experience a high percent of student dropouts tend to:

Practice ability grouping and tracking;
Not have sufficient texts available;
Be more urban in their location;
Have fewer graduates going on to college;
Be larger and have more pupils per teacher;
Use teacher examinations in the appointment process;
Have a smaller percent of students in daily attendance;
Have many problems (discipline of students, vandalism, etc.), as estimated by the principal.

Teachers in these schools tend to:

View the school as a less desirable teaching situation;
Have experienced more mobility in their careers;
Have a slightly lower preference for teaching high-ability students;
Be nonwhite;
Have lower scores on the vocabulary test;
Have a high proportion of nonwhite students in their classes;
Have been assigned to the school in which they are currently teaching.

The students in these schools tend to be from the lower socioeconomic strata and to have a less well-knit family structure, a less favorable attitude toward life, and lower achievement levels. They also tend to be nonwhite.

SUMMARY

This chapter presented a list of all the variables to be used in subsequent analyses. Correlations of these variables with variables that were deemed to be of special interest were discussed and summarized. The upper limit of the percent of variance that can be explained by studying the correlates of differences among schools was given for a number of different school outcome measures, as well as for a number of variables concerned with the nature and composition of the student body.

The measures that had the greatest number of variables correlated with them were Student Body's Socio-Economic Status, Achievement and Racial-Ethnic Composition. The next highest in this respect were Principal's Training; Student Body's Family Structure, and Attitude Toward Life; School's Rural-Urban Location; Student Body's Educational Plans and Study Habits; and School's Size (Enrollment). The third highest included Percent Going on to College, the Student Body's Expectations, and Percent of Dropouts. The lowest group included Pupil-Teacher Ratio, Percent Nonwhite Going on to College, Percent Going on to Vocational Training (both Total and Nonwhite).

5. Regression and Commonality Analyses of School Attributes and Outcomes

This entire study is based on the assumption that at least some of the differences among public schools in the United States are related in a causal manner to the attitudes and achievement levels of their students. Our objective, then, is twofold: To find characteristics or attributes of the schools that seem to be related to school outcomes, and to suggest which of these characteristics may be most important in producing these outcomes. In this chapter we attempt to pinpoint a number of such characteristics. Since the data being used are associational in nature, and since we realize that there are pitfalls in making causal inferences from associational data, associational language will be used in discussion and summarization. Possible causal inferences will be reserved till last, as part of the chapter summary. At this point, too, we will state explicitly how we think these associational data can be used as a basis for such causal inferences.

5.1. SELECTION OF VARIABLES FOR ANALYSIS

In order to waste as few of our data as possible we conducted an analysis using every one of our indices, together with a number of variables deemed to be of special interest.[1] However, in order to assign each index a part in the analysis we had to make certain decisions that require comment here. Some of the student indices, in addition to Achievement, can be regarded as being influenced by both the school and the student's home background. Others, however, are relatively uninfluenced by the school. For example, the student's Socio-Economic Status, Family Structure and Racial-Ethnic group membership are not readily influenced by the school. But they do have important influences, as we suggested in the previous chapter, on the functioning of the schools. Still other indices, such as the student's Expectations, Attitude Toward Life, Educational Plans and Desires, and Study Habits can be influenced by both the home background and the school. Because of these considerations the following indices,[2] in addition to the Achievement composite, were included as dependent variables, or outcome measures, in our analyses:

DEPENDENT VARIABLES (OUTCOME MEASURES)

Expectations for Excellence;
Attitude Toward Life;
Educational Plans and Desires;
Study Habits;
Achievement;
Percent of 12th-Grade Graduates Going on to College;
Percent of 12th-Grade Nonwhite Graduates Going on to College;
Percent of 12th-Grade Graduates Going on to Vocational Training;
Percent of 12th-Grade Nonwhite Graduates Going on to Vocational Training;
Percent of 10th-Grade Boys Who Drop Out of School Before Completion of the 12th Grade.

It is often assumed in this type of analysis that schools must be equated for the kinds of students they get initially. Thus if school "A" has children primarily from families where intellectual activities are not valued or pursued, and school "B" has children from families that are just the opposite, then one would expect the students in school "B" to have higher achievement levels than those in school "A." The difference between these two groups of students can be attributed to differences in their families, not their schools.

We saw no reason to quarrel with this type of approach. It seemed most appropriate to equate schools for differences in their students' home background and racial-ethnic composition. To represent home background we selected the student index of Socio-Economic Status and that of Family Structure and Stability. To represent the racial and ethnic composition of the student body we used student Racial-Ethnic Group Membership. These variables are defined elsewhere.[3]

Other variables that might have been included in Student Body Social Background, such as whether English as opposed to some other language is spoken in the home, were excluded on the grounds that the social background of the students should be represented, insofar as possible, by a set of explanatory variables that could be considered absolutely basic to the family's position in society. For example, both the racial-ethnic background of a family and its socioeconomic status can be used to explain, in part, whether or not English is spoken in the home.[4]

School Variables.—As an aid in the selection of a comprehensive set of school variables a number of preliminary regression analyses were conducted. The analyses resulted in selection of the following set of school variables: [5]

[1] E.g., Pupil-Teacher Ratio and Teacher's Racial-Ethnic Group Membership.

[2] See chapter 3 for the manner of index construction, and appendixes III, VI, and IX for descriptions of the variables involved.

[3] In chapter 3 and appendix III.

[4] Many of these potential background variables are analyzed in chapter 6.

[5] Exclusion of the other school variables resulted in a loss of only 1 percent of the variance. See Mayeske et al., Technical Note No. 61 in the List of References (p. 115).

Facilities

(1) Plant and Physical Facilities;
(2) Instructional Facilities;
(3) Age of Building;
(4) Pupils Per Room.

Pupil Programs and Policies

(1) Tracking;
(2) Testing;
(3) Transfers;
(4) Remedial Programs;
(5) Free Milk and Lunch Programs;
(6) Accreditation;
(7) Age of Texts;
(8) Availability of Texts;
(9) Pupil-Teacher Ratio;
(10) Enrollment.

School Personnel and Personnel Expenditures

(1) Principal's Experience;
(2) Principal's Training;
(3) Principal's College Attended;
(4) Principal's Sex;
(5) Principal's Estimate of the School's Reputation;
(6) Specialized Staff and Services;
(7) Teacher's Experience;
(8) Teacher's Training;
(9) Teacher's Socio-Economic Background;
(10) Teacher's Localism;
(11) Teacher's College Attended;
(12) Teaching Conditions;
(13) Teaching-Related Activities;
(14) Preference for Student Ability Level;
(15) Teacher's Sex;
(16) Teacher's Racial-Ethnic Group Membership
(17) Teacher's Vocabulary Score.

Thus, the total set of school variables is comprised of the four Facilities variables, the 10 Pupil Program and Policy variables, and the 17 School Personnel and Personnel Expenditures variables. This set of 31 variables will hereafter be referred to as the set of "School" variables.

5.2. A CRITICAL ASSUMPTION IN STUDYING SCHOOL INFLUENCES

Before equating schools for the social background of their students it may be instructive to look at the correlations of our Social Background variables, both with one another and with the outcome measures of interest. These correlations are given in table 5.2.1 for grades one, three, six, and nine, and in table 5.2.2 for grade 12.

The terminology used in these tables is in keeping with our earlier agreement to use associational rather than causal language. Accordingly the term "regressor" variable is used instead of "independent" variable, and "dependent" variable indicates a variable that exhibits values associated with or related to the regressor variables, but not necessarily in a causal relationship.

The correlates of Achievement are given in row 8 and column 8 of tables 5.2.1 and 5.2.2. Let us focus here on the manner in which the three Social Background variables of Socio-Economic Status, Family Structure, and Racial-Ethnic composition relate to Achievement at the different grade levels. It will be seen that the correlations with Achievement tend to increase in magnitude as the students progress through the higher grade levels. This same trend tends to hold good for some of the other outcome measures. The correlations here suggest that after schools have been equated for these initial differ-

Table 5.2.1.—Intercorrelations of the Regressor and Dependent Variables for the 9th, 6th, 3d, and 1st Grades

	SES (1)	FSS (2)	REC (3)	EXP (4)	ATT (5)	ED PLN (6)	STDY (7)	ACH (8)	School variables [2] (9)
					9th/6th[1]				
1. Socio-Economic Status (SES)	100	60	67	48	58	64	60	82	80
2. Family Structure and Stability (FSS)	67	100	66	67	73	61	72	67	67
3. Racial-Ethnic Composition (REC)	68	70	100	46	51	45	47	80	91
4. Expectations (EXP)	47	66	28	100	77	72	76	50	48
5. Attitude Toward Life (ATT)	60	75	60	72	100	73	86	60	30
6. Educational Plans and Desires (ED PLN)	69	56	28	69	62	100	77	64	57
7. Study Habits (STDY)	57	82	42	82	79	68	100	59	28
8. Achievement (ACH)	82	66	84	31	64	50	46	100	86
9. School Variables (full set of 31)[4]	82	65	92	42	59	56	45	87	100
					3rd/1st[3]				
1. Socio-Economic Status (SES)	100	44	60					61	73
2. Family Structure and Stability (FSS)	48	100	59					37	66
3. Racial-Ethnic Composition (REC)	65	58	100					56	92
4. Expectations (EXP)	28	47	23	100					
5. Attitude Toward Life (ATT)	20	46	22	51	100				
6. Educational Plans and Desires (ED PLN)	35	39	31	51	41	100			
7. Study Habits (STDY)	60	60	53	52	41	48	100		
8. Achievement (ACH)	68	46	63	25	22	36	52	100	68
9. School Variables (full set of 31)[4]	78	56	90	28	30	38	60	70	100

[1] The 9th grade correlations are below the main diagonal and the 6th grade above the main diagonal. All correlations have been rounded to 2 places of decimals and leading decimal points omitted.

[2] This row contains the full set of school variables with each of the other variables. There were 923 schools included in the 9th grade analyses and 2,372 for the 6th grade.

[3] The 3d-grade correlations are below the main diagonal and the 1st grade above the main diagonal. Indices other than those presented were not available for the 1st grade.

[4] This row or column contains the full set of school variables with each of the other variables. There were 2,453 schools included in the 3d-grade analyses and 1,302 for the 1st grade.

Table 5.2.2.—Intercorrelations of the 12th-Grade Regressor and Dependent Variables

	(1) SES	(2) FSS	(3) REC	(4) EXP	(5) ATT	(6) ED PLN	(7) STDY	(8) ACH	(9) PTOCOL	(10) PNT-OCOL	(11) PT OVOC	(12) PNT-OVOC	(13) PBDRP
1. Socio-Economic Status (SES)	100	53	59	−15	44	49	34	81	61	−07	12	−13	−23
2. Family Structure and Stability (FSS)	53	100	59	−03	67	28	56	63	34	−10	10	−06	−27
3. Racial-Ethnic Composition (REC)	59	59	100	−38	54	−05	11	80	30	−21	11	−20	−30
4. Expectations (EXP)	−15	−03	−38	100	09	45	39	−23	−01	−06	−10	−02	05
5. Attitude Toward Life (ATT)	44	67	54	09	100	32	58	62	36	−07	01	−12	−31
6. Educational Plans and Desires (ED PLN)	49	28	−05	45	32	100	43	34	60	08	−03	01	−14
7. Study Habits (STDY)	34	56	11	39	58	43	100	22	25	00	−04	−07	−16
8. Achievement (ACH)	81	63	80	−23	62	34	22	100	56	−13	11	−14	−30
9. Percent Going on to College (PTOCOL)	61	34	30	−01	36	60	25	56	100	11	−04	04	−26
10. Percent Nonwhite Going on to College (PNTOCOL)	−07	−10	−21	−06	−07	08	00	−13	11	100	01	51	12
11. Percent Going on to Vocational Training (PTOVOC)	12	10	11	−10	01	−03	−04	−11	−04	01	100	18	02
12. Percent Nonwhite Going on to Vocational Training (PNTOVOC)	−13	−06	−20	−02	−12	01	−07	−14	04	51	18	100	15
13. Percent of Boy Dropouts (PBDRP)	−23	−27	−30	05	−31	−14	−16	−30	−26	12	02	15	100
14. School Variables (full set of 31)[1]	86	70	95	52	65	65	40	89	72	45	51	48	56

[1] This row contains the multiple correlation of the full set of 31 school variables with each of the other variables. There were 780 schools included in these analyses. All correlations have been rounded to 2 places of decimals and leading decimals points omitted.

ences they may exhibit very few differences, in Achievement or in the other outcome measures, that can be related to other school variables.

Table 5.2.3 gives the squared multiple correlations for the regression of the Outcome measures on the three student body variables of Socio-Economic Status, Family Structure, and Racial-Ethnic composition. Why should school achievement be so highly predictable from these three variables? One interpretation is that the results reflect the current social organization of our school system. Thus, schools are organized along residential lines, and residential areas are in turn organized along socio-economic and racial-ethnic lines. This line of thought is further supported by the analyses of individual students (see pp. 16–17), when they are not aggregated by schools. These analyses showed that individual student achievement was moderately predictable from the student's Socio-Economic Status, Family Structure and Racial-Ethnic group membership.

One can infer that some kind of a sorting process is going on here. White students, presumably, have higher achievement levels and socioeconomic status. They go to school with other students of the same kind. This has the effect of making their aggregated school achievement more predictable than their individual achievement. It does not, however, explain why the predictability of school Achievement increases as one progresses from the lower to the higher grade levels.

If one is willing to grant that some kind of a sorting process takes place, then what can one say about the possible influence of School variables? Table 5.2.3 shows that almost all of the Outcome measures, with the notable exception at the 12th grade of Expectations and the special outcome measures, are more predictable from the

Table 5.2.3.—Squared Multiple Correlations[1] for Regression of Outcome Variables Against Student Body Social Background and School Variables

Grade Level	Variable set	Expectations	Attitude toward life	Educational plans	Study habits	Achievement	Percent to college		Percent to vocational		Percent of boy dropouts
							All	Nonwhite	All	Nonwhite	
12th	1. Student Body	20	48	47	42	82	38	05	02	05	10
	2. School	38	42	42	16	79	51	20	26	23	32
	3. Student Body and School	44	56	61	56	86	57	23	27	24	34
	4. (3)—(1)[2]	25	07	15	14	04	19	18	25	20	24
	5. (3)—(2)[2]	06	14	19	40	08	06	03	01	02	03
9th	1. Student Body	52	58	61	74	82					
	2. School	18	35	32	20	76					
	3. Student Body and School	63	64	67	78	87					
	4. (3)—(1)[2]	11	05	06	04	05					
	5. (3)—(2)[2]	45	29	35	58	11					
6th	1. Student Body	46	57	50	57	79					
	2. School	23	30	33	28	73					
	3. Student Body and School	49	58	52	60	83					
	4. (3)—(1)[2]	03	02	02	02	04					
	5. (3)—(2)[2]	26	29	19	31	10					
3d	1. Student Body	24	22	19	49	53					
	2. School	08	09	15	36	49					
	3. Student Body and School	26	27	21	53	56					
	4. (3)—(1)[2]	03	06	03	04	04					
	5. (3)—(2)[2]	19	18	07	17	07					
1st	1. Student Body					43					
	2. School					47					
	3. Student Body and School					52					
	4. (3)—(1)[2]					09					
	5. (3)—(2)[2]					05					

[1] Rounded to 2 places of decimals with leading decimal points deleted.

[2] Apparent errors due to rounding after subtractions.

Student Body Social Background variables than from the School variables.

It will be noted that the unique portions associated with the School variables are small. Does this mean that they are unimportant? Not necessarily. As we suggested earlier, the School variables tend to be bound up with the Student Body Social Background variables. A measure that expresses this degree of overlap or commonness follows.[6]

5.3. COMMONALITY ANALYSES: THE TWO-SET CASE

5.3.1. Development of a Measure of Commonality for Two Sets of Variables

Consider the case where there are two sets of variables: a set of Student Body Social Background variables (B), and a set of School variables (S).

Let

$C(BS)$ be the second-order commonality coefficient, viz, that portion of the squared multiple correlation that may be associated with either B or S

$R^2(B)$ be the squared multiple correlation of B with the dependent variable

$R^2(S)$ be the squared multiple correlation of S with the dependent variable

$R^2(BS)$ be the squared multiple correlation of B and S with the dependent variable

then

$U(B) = R^2(BS) - R^2(S)$ means that the unique portion or first-order commonality coefficient[7], $U(B)$, is that portion of $R^2(BS)$ that can only be associated with B

and

$U(S) = R^2(BS) - R^2(B)$ means that the unique portion or first-order commonality coefficient[7], $U(S)$, is that portion of $R^2(BS)$ that can only be associated with S

Then

$C(BS) = R^2(BS) - U(B) - U(S)$

and

$R^2(S)$ can be expressed as $R^2(S) = C(BS) + U(S)$

and

$R^2(B)$ can be expressed as $R^2(B) = C(BS) + U(B)$

The values for $U(B)$, $U(S)$, $C(BS)$, $R^2(B)$, $R^2(S)$ and $R^2(BS)$ may be given in tabular form as follows:

Commonality coefficients	Sets of regressor variables	
	B	S
First Order U(B)	XXX	.....
First Order U(S)	.....	XXX
Second Order C(BS)	XXX	XXX
R^2 For a Single Set of Variables	$R^2(B)$	$R^2(S)$
R^2 For Both Sets of Variables	$R^2(BS)$	$R^2(BS)$

In the above table the first column refers to the Student Body variables (B). The XXX's and R^2 represent empirically observed values. In reading down this column, the first entry, $U(B)$ is the portion of $R^2(BS)$ uniquely associated with the Student Body variables. The second entry is the value for the second-order commonality coefficient $C(BS)$. These two entries sum to the squared multiple correlation, $R^2(B)$. The squared multiple correlation $R^2(BS)$ obtained when both sets of variables are entered into the regression is presented for purposes of comparison with the squared multiple correlations for the individual sets of variables. The second column refers to the School variables (S). The XXX's sum to the squared multiple correlation, $R^2(S)$. Table 5.3.2.1 gives these different values for the main dependent variables and table 5.3.2.2 for the special 12th-grade outcome measures.

5.3.2. Regression and Commonality Analyses for Two Sets of Variables

The main question for which answers are being sought in this section is: How much of the predictable variance in our measures of School Outcomes can be uniquely apportioned to either B or S, and how much is common to both? If the amount of predictable variance they have in common is a large one, then it will be very difficult to infer anything at all about school influences as such.

Table 5.3.2.1. illustrates the means by which we have endeavored to answer this type of question. It will be seen here that for Expectations for Excellence there is a general increase in the level of predictability,[8] followed by a decrease at the 12th grade, when both sets of variables are entered into the regression. Inspection of the unique portions shows a decrease for B and an increase in S up to the 12th grade, at which point there is a dramatic reversal in their respective magnitudes. It will also be seen that the second-order commonality coefficient, $C(BS)$, behaves in a somewhat erratic manner. What does appear as a clear trend is that the unique portion for S assumes a larger role at grades 12 and nine.

The behavior of Attitude Toward Life is more consistent. The absolute level of predictability[9] tends to increase as one ascends the grade levels, but then drops slightly at the 12th grade. The unique portion for B behaves in similar fashion. The unique portions for S remain low, although they are slightly higher at the 12th grade. The commonality coefficients show a progressive increase as one moves up the levels. This trend suggests that the School variables and the Student Body variables become more correlated with one another in their prediction of Attitude Toward Life the longer they are associated with one another as part of the educational process.

Educational Plans and Desires shows a consistent increase in the squared multiple correlation for both sets of variables through grade nine, and then a slight decline at grade 12. The unique portion for B follows the same trend. There is a marked increase in $C(BS)$ from the third to the sixth grade, but it tapers off. The larger

[6] A mathematical exposition of this technique is given in appendix II, under separate cover.

[7] Often abbreviated to "unique association."

[8] I.e., in the absolute value of the squared multiple correlation.

[9] I.e., the squared multiple correlation for both sets combined.

Table 5.3.2.1.—Squared Multiple Correlations [1] of B and S With Dependent Variables, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Grade level	Commonality coefficients	Expectations		Attitude toward life		Educational plans and desires		Study habits		Achievement		No. of schools
		B	S	B	S	B	S	B	S	B	S	
12th	First Order:											
	U(B)	06		14		19		40		08		
	U(S)		25		07		15		14		04	
	Second-Order C(BS)	13	13	35	35	27	27	01	01	75	75	
	R^2 for a Single Set of Variables	20	38	48	42	47	42	42	16	82	79	
	R^2 for Both Sets of Variables (B and S)	44	44	56	56	61	61	56	56	86	86	780
9th	First Order:											
	U(B)	45		29		35		58		11		
	U(S)		11		05		06		04		05	
	Second Order C(BS)	07	07	30	30	26	26	16	16	71	71	
	R^2 for a Single Set of Variables	52	18	58	35	61	32	74	20	82	76	
	R^2 for Both Sets of Variables (B and S)	63	63	64	64	67	67	78	78	87	87	923
6th	First Order:											
	U(B)	26		29		19		31		10		
	U(S)		03		02		03		02		04	
	Second Order C(BS)	20	20	28	28	31	31	26	26	69	69	
	R^2 for a Single Set of Variables	46	23	57	30	50	33	57	28	79	73	
	R^2 for Both Sets of Variables (B and S)	49	49	58	58	52	52	60	60	83	83	2,372
3rd	First Order:											
	U(B)	19		18		07		17		07		
	U(S)		03		06		03		04		04	
	Second Order C(BS)	05	05	03	03	12	12	32	32	45	45	
	R^2 for a Single Set of Variables	24	08	22	09	19	15	49	36	53	49	
	R^2 for Both Sets of Variables (B and S)	26	26	27	27	21	21	53	53	56	56	2,453
1st	First Order:											
	U(B)									05		
	U(S)										09	
	Second Order C(BS)									38	38	
	R^2 for a Single Set of Variables									43	47	
	R^2 for Both Sets of Variables (B and S)									52	52	1,302

[1] Rounded to 2 places of decimals with leading decimal points deleted.

unique portions for S at grades nine and (especially) 12, combined with a relatively stable second-order commonality, suggest that the schools have a greater role in influencing this outcome at the higher grade levels.

The squared multiple correlations obtained when both sets of variables are entered into the regression shows a consistent increase for Study Habits through grade nine, followed by a decrease at grade 12. The unique portion for B increases at the higher grade levels, while the unique portions for S remain similar—except at grade 12, where they almost triple in magnitude. It is of interest to note that the second-order commonality coefficient, $C(BS)$, decreases as the grade level increases. This trend, coupled with the increases in the unique portions for B at the higher grade levels, suggests that the Student Body variables may play an increasingly important role in Study Habits that bears little relationship to the school's facilities, staff, or programs.

Perhaps the most important variable in table 5.3.2.1 is Achievement, in the right-hand column. It is well represented at all grade levels. Since students were tested in the early fall, about three weeks after the semester had started, we can get some idea of how the School variables relate to Achievement at the first grade before they have had much of an oportunity to influence the students. In a sense, this is a near-zero point in the relationship. In fact, most of the relationships of the outcome variables at this point reflect the manner in which the nature of the student inputs are related to school attributes or resources. We saw in table 5.2.1 that at the first grade the school variables were moderately to highly related to the students' Achievement, Socio-Economic Status, Family Structure and Racial-Ethnic Composition. The last three variables are in turn moderately related to Achievement. Table 5.3.2.1 shows that when both sets of variables are entered into the regression the squared multiple correlation at the first grade is about .52. Interestingly enough, at the first grade Achievement is slightly more predictable with S than with B.[10]

Similarly, there is a greater unique portion here for S than for B. This correlation of S with B as they relate to Achievement is reflected by $C(BS)$. It indicates that white children from the higher socioeconomic strata enter school with higher achievement levels than do nonwhite students from the lower socioeconomic strata. It also indicates that the white children tend to enroll in schools that have attributes or resources differing systematically from those of the schools in which the lower class, nonwhite students enroll.[11]

Some indication of the kinds of variables involved in the relatively large unique portion for S at the first

[10] An analysis at the 1st grade was run to find out if a more comprehensive set of student body variables would reduce the magnitude of the unique portion for the School variables. In addition to Socio-Economic Status, Family Structure and Racial-Ethnic Composition, Percent of Entering Students Who Had Attended Kindergarten was included in the Student Body set, and the same for nursery school. Although this larger set slightly increased both the commonality and the unique portion for B, it left the unique portion for S relatively unchanged.

[11] The kinds of school variables that are related to Achievement were discussed in chapter 4.

grade can be obtained from table 6.5.1 (p. 57). The School variables that retain a relationship with Achievement after correlations attributable to the Student Body's Social Background have been partialed out are: Teaching Conditions, Percent White of the Students in Teacher's Class, Teacher's Vocabulary Score, and Percent of Students Who Attended Kindergarten. A number of these same variables also retain partial relationships at the higher grade levels (see tables 6.1.1–6.5.1). It will be remembered that much of this information was given us by the school's staff. If there is consistency in the kinds of students they get every year, then certain things the staff say about their most recent students will also hold for the students they are about to receive. If so, this would help to explain the existence of a unique contribution of *S* to the prediction of Achievement at a near-zero point in the possible influence *S* could have had on Achievement.

It is also noteworthy that the squared multiple correlations show a sharp increase from the third to the sixth grade and they remain high at the higher grade levels. A reversal in the unique portion for *B* and *S* occurs at the third grade, and this trend persists at the higher grades. The second-order commonality coefficient shows a progressive increase from the first to the 12th grades. Taken together, these trends suggest that the role the schools play in the achievement levels of their students may well be bound up with the kinds of students they get initially.

Table 5.3.2.2 presents the squared multiple correlations and unique portions for those dependent or outcome variables that are specific to schools with a 12th grade. These variables are:

> The percent of students from last year's graduating class who went on to a regular 2-year or 4-year college; The percent of nonwhite students from last year's graduating class who went on to a regular 2-year or 4-year collage;
>
> The percent from last year's graduating class who went on to some postsecondary education or training other than a junior college or 4-year college;
>
> The percent of nonwhites from last year's graduating class who went on to some postsecondary education or training other than a junior college or 4-year college;
>
> The approximate percent of boys who entered the 10th grade but dropped out before graduation.[12]

For Percent Going on to College, inspection of table 5.3.2.2 shows that *B* has a smaller unique portion than *S*. However, the second-order commonality coefficient shows that most of the variance predictable from *B* is bound up with *S*. Further, Percent Going on to College is more predictable from *S*. These results suggest that the schools may play a greater role in Percent Going on to College than does the student's social background. Nevertheless, the large area of overlap indicates that white students from the higher socioeconomic strata are the ones who tend to go on to college, and that they also tend to go to school with one another.

A somewhat different trend holds for the four remaining outcome variables. Although *S* still has a greater unique portion than *B*, and although the outcome variables are more predictable from *S* than from *B*, the second-order commonality coefficient *C*(*BS*) is smaller for these four variables. These results suggest that *S* may have a greater role than *B* to play in these outcomes independently of the kinds of students that the schools get initially. A later section of this chapter attempts to determine the aspects of the school for which this is true.

The skeptic might argue, however, that the above trends may be due to one of the following considerations, or even to a combination of both:

> (1) indices such as Socio-Economic Status, Family Structure and Achievement are comprised of fewer variables at the lower grade levels, which would tend to result in a lower correlation of the indices with other variables;
>
> (2) similar kinds of variables[13] are included in both *S* and *B*, which would tend to inflate the correlations of School variables with Student Body variables as they relate to the Outcome measures.

Let us consider (1) first. Certainly, caution must be exercised in inferring a trend for those outcome measures, such as Expectations and Attitude Toward Life, that are sparsely represented at the third grade. It should be pointed out, however, that this representation improves markedly at the sixth grade, and is identical for the ninth and 12th grades. Moreover, the problem is least

[12] Excluding transfers.

[13] E.g., student's Racial-Ethnic Group Membership and teacher's ditto.

Table 5.3.2.2.—Squared Multiple Correlations [1] of the 12th-Grade Student Body B and School Variables S With the 12th-Grade Outcome Measures, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Dependent variables									
	Percent going on to college		Percent nonwhite going on to college		Percent going on to vocational training		Percent nonwhite going on to vocational training		Percent of boys who drop out	
Commonality coefficients [2]	B	S	B	S	B	S	B	S	B	S
First Order	06	19	03	18	01	25	02	20	03	24
Second Order C(BS)	32	32	02	02	01	01	03	03	08	08
R^2 for a Single Set of Variables	38	51	05	20	02	26	05	23	10	32
R^2 for Both Sets of Variables (B and S)	57	57	23	23	27	27	24	24	34	34

[1] Rounded to 2 places of decimals with leading decimal points deleted.

[2] There were 780 schools included in these analyses.

acute for Socio-Economic Status and Family Structure, since they are the indices best represented at all grade levels. For the School variables the problem does not arise at all, since they are the same for the different grade levels. Indeed, many of the schools that have student information for grade one in the sample also have student information for grades three and six in the sample. As for Achievement, it is well to recall from table 4.2 in chapter 4 that about 36 percent of total Achievement variance is associated with the schools students attend, for all grade levels. The relative constancy of these values suggests that although caution must be exercised in inferring trends for the different outcome measures, this problem is least prevalent for Achievement.

In reply to (2), it can be pointed out that a number of preliminary analyses were conducted as a guide in selecting a comprehensive set of school variables. One of these analyses, given in table 5.3.2.3, involved eliminating the teachers' Racial-Ethnic composition. When the values in table 5.3.2.3 are compared with their counterparts in table 5.3.2.1 it becomes clear that the decrease in the squared multiple correlation when both sets of variables are entered into the regression is very small. There is also little or no decrease in the squared multiple correlations for B and S alone, or in the unique portions and second-order commonality coefficients for all of the outcome measures, except Achievement. Here, $C(BS)$ shows a marked decrease, as does the squared multiple correlation of S. The unique portion for S stays about the same, while the unique portion for B about doubles in magnitude. Thus, what was common to the Racial-Ethnic composition of both the student body and the teachers has now been attributed to B.

Since the reduction in predictability for S is small for all the dependent variables except Achievement, these analyses suggest that there may be something about being a white or nonwhite teacher that is of considerable importance for Achievement but not for the other variables. Perhaps there is an entire constellation of lifetime events involved in being a white or nonwhite teacher that is just not covered by our set of teacher and other school indices (see p. 28). In any case, the teachers' Racial-Ethnic Composition, rather than being a variable to be excluded from the analysis, appears to be an essential ingredient in it, especially for school Achievement.

The skeptic may still feel that we need a subset of school variables that is less bound to existing social conditions. An attempt was made to select such a subset in order to rerun these analyses. However, inspection of these variables showed that very few of them lacked some relationship to the socially determined needs or advantages of the student body. For example, free lunch and milk programs tend to be found in nonwhite schools of lower *SES*, while the size, facilities, and expenditures of a school are related to whether its location is rural or urban.[14] Indeed, if a school is at all influenced by the resources of its students or responsive to their needs, then many of the school variables will of necessity be related to the nature of the student body. Consequently, the set of school variables should be comprehensive in nature.

It may also be suggested that, since there are regional differences in Achievement and perhaps in other School Outcomes as well, differences that might better be attributed to regions are being attributed to differences among schools. There is some justice in this objection, inasmuch as regional differences, as well as differences among rural, urban, and suburban schools are of interest. A later report in this series will address itself to this topic. The present report, however, addresses itself more to differences among schools on a nationwide basis.[15]

In view of the small unique portion for S with some of the outcomes, there remains the question of whether or not any particular subset of School variables has higher commonality coefficients with B than other subsets. In order to answer this question, it is necessary to develop commonality coefficients for four sets of variables.

5.4. COMMONALITY ANALYSES: THE FOUR-SET CASE

The four-set case is considerably more complicated than the two-set case because a number of higher order commonality coefficients are introduced.[16]

5.4.1. Development of Commonalities for Four Sets

Let the four sets of variables be denoted by X_1, X_2, X_3, and X_4. Then the unique portion or first-order commonality coefficients for the ith set is given by

$$U(X_i) = R^2(X_1X_2X_3X_4) - R^2(X_jX_kX_l)$$

where

$R^2(\#)$ represents the squared multiple correlation for the particular set of variables in parenthesis with the dependent variable.

[14] See chapter 4.

[15] See chapter 7, for an attempt to develop a school taxonomy that would supplant both regional and rural-urban groupings.

[16] See appendix II for an exposition of the general case, under separate cover.

Table 5.3.2.3.—Squared Multiple Correlations [1] of the 9th-Grade Student Body B and School Variables S Excluding Teacher Racial-Ethnic Composition, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Dependent variable									
	Expectations		Attitude toward life		Educational plans and desires		Study habits		Achievement	
	B	S	B	S	B	S	B	S	B	S
First Order	45	10	34	05	35	06	59	04	23	04
Second Order C(BS)	07	07	25	25	26	26	15	15	59	59
R^2 for a Single Set of Variables	52	17	58	30	61	32	74	19	82	63
R^2 for Both Sets of Variables (B and S)	62	62	64	64	66	66	78	78	87	87

[1] Rounded to two places of decimals with leading decimal points deleted.

[2] There were 923 schools included in these analyses.

As an example, the unique portion for the fourth set would be written as

$$U(X_4) = R^2(X_1X_2X_3X_4) - R^2(X_1X_2X_3)$$

There is one unique value for each set of variables (in this case, the value is 4).

The second-order commonality coefficient is given by

$$C(X_iX_j) = R^2(X_1X_2X_3X_4) - R^2(X_kX_l) - U(X_i) - U(X_j)$$

As an example, the second-order commonality coefficient for the third and fourth sets is

$$C(X_3X_4) = R^2(X_1X_2X_3X_4) - R^2(X_1X_2) - U(X_3) - U(X_4)$$

There is one second-order commonality coefficient for each combination of sets (in this case, it is 6).

The third-order commonality coefficient is given by

$$C(X_iX_jX_k) = R^2(X_1X_2X_3X_4) - R^2(X_l) - C(X_iX_j) - C(X_iX_k) - C(X_jX_k)$$

There is one third-order commonality coefficient for each three-way combination (in this case, it is 4).

The fourth-order commonality coefficient, of which there is only one, is given by

$$C(X_1X_2X_3X_4) = R^2(X_1X_2X_3X_4) - C(X_1X_2X_3) - C(X_1X_2X_4) - C(X_1X_3X_4) - C(X_2X_3X_4) - C(X_1X_2) - C(X_1X_3) - C(X_1X_4) - C(X_2X_3) - C(X_2X_4) - C(X_3X_4) - U(X_1) - U(X_2) - U(X_3) - U(X_4)$$

or

> the fourth-order coefficient can be verbally described as the squared multiple correlation for all four sets, R^2 $(X_1X_2X_3X_4)$, minus the sum of the four third-order commonalities, $C(X_iX_kX_l)$, minus the sum of the six second-order commonalities, $C(X_iX_k)$, minus the sum of the four unique associations

It follows that the squared multiple correlation for the X_4 set can be represented as the sum of its unique association and its different order commonalities, thus

$$R^2(X_4) = C(X_1X_2X_3X_4) + C(X_1X_2X_4) + C(X_1X_3X_4) + C(X_2X_3X_4) + C(X_1X_4) + C(X_2X_4) + C(X_3X_4) + U(X_4)$$

The four sets of variables to be used in these analyses were outlined in section 5.1 of this chapter. In addition to B as a designation for the set of three Student Body Social Background variables, we shall use

- T, for the set of 17 School Personnel and Personnel Expenditure variables
- P, for the set of 10 Pupil Programs and Policies variables
- F, for the set of four Facilities variables.

These measures may be represented in tabular form as follows:

Commonality coefficients	Sets of regressor variables B	T	P	F
First order:				
U(B)	XXXX			
U(T)		XXXX		
U(P)			XXXX	
U(F)				XXXX
Second order:				
C(BT)	XXXX	XXXX		
C(BP)	XXXX		XXXX	
C(BF)	XXXX			XXXX
C(TP)		XXXX	XXXX	
C(TF)		XXXX		XXXX
C(PF)			XXXX	XXXX
Third order:				
C(BTP)	XXXX	XXXX	XXXX	
C(BTF)	XXXX	XXXX		XXXX
C(BPF)	XXXX		XXXX	XXXX
C(TPF)		XXXX	XXXX	XXXX
Fourth order: C(BTPF)	XXXX	XXXX	XXXX	XXXX
R^2 for a single set of variables	$R^2(B)$	$R^2(T)$	$R^2(P)$	$R^2(F)$

In the above tabulation the "X's" in the first column represent the unique portion for B, together with the amount of predictable variance that it shares with the other sets of variables. The second-order commonality coefficients show the amount of predictable variance that may be associated with either of the two sets under consideration in each case. The third-order commonality coefficients show the amount of predictable variance that may be associated with any of the three sets, but not the fourth. The fourth-order commonality coefficient, $C(BTPF)$, represents the variance that may be associated with any of the four sets. The unique portions and the commonality coefficient values in each column sum to the squared multiple correlation, R^2, for that set of variables. In the other columns, the commonality coefficients have the same values for the two, three or four sets represented in the parentheses. The tables in the following sections give the four-set commonalities for the different outcome measures.

5.4.2. Regression and Commonality Analyses for Four Sets of Variables

In section 5.3.2 we attempted to determine how much of the predictable variance in our set of School Outcome measures could be uniquely associated with S or B, and how much was common to the two sets. We found that much of the predictable variance was common to these two sets of variables, particularly for Achievement. We then wondered if there was some subset of the School variables that had more in common with the Student Body Social Background variables than the other sets.

This section, on the other hand, attempts to answer the question: How much of the predictable variance in our measures of School Outcomes can be uniquely apportioned to B, or one of the subsets of S, and how much of it is common to the different combinations of the sets under consideration? Since many of the indices are sparsely represented at the third grade, emphasis will not be given to trends that originate there unless they are in alignment with the trend at the higher grade levels. Commonality values of 0.01 or less will not be

discussed. Negative commonalities will be regarded as equivalent to zero.

Table 5.4.2.1 gives the commonality values for Expectations. It will be noticed that, at each grade level, *T* is the subset of School variables that has the largest unique portion. The unique portion for *P* shows an increase at grades nine and 12, while the portion for *F* has an appreciable value at only the 12th grade. Inspection of the second-order commonalities shows that the largest amounts of predictable variance are shared in common by *B* and *T*. There are slight second-order commonality values at grades nine and 12 for *T* and *P*, and at grades six and nine for *B* and *P*. A slight value for *P* and *F* is part negligible. The squared multiple correlations for each individual set of variables indicate that *B* and *T* found at grade 12 only. Both the third-order and the fourth-order commonality coefficients are for the most yield the greatest predictive power. These trends taken together suggest that *B* may play the greatest role in the development of Expectations, while at the higher grade levels the Student Body variables may come to share this role by virtue of their relationship or shared variance with *T*. At the higher grade levels, both *P* and *F* may also play roles.

Table 5.4.2.2 gives the four-set commonalities for Attitude Toward Life. Inspection of the unique portions for the different grade levels shows that *B* has the largest value, while *T* and *P* increase very slightly at grades nine and 12. The second-order commonalities show that most of the predictable variance in Attitude Toward Life is common to *B* and *T*. The other second-order commonalities do not show any clear trends. There is some slight variance in *B* and *P* at the ninth grade, and in *P* and *F* at the 12th grade. Those third-order commonality

Table 5.4.2.1.— Squared Multiple Correlations [1] of B, T, P, and F With Expectations, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Grade level							
	3d				6th			
Commonality coefficients [2]	B	T	P	F	B	T	P	F
First order:								
U(B)	19				26			
U(T)		01				02		
U(P)			01				01	
U(F)								
Second order:								
C(BT)	03	03			13	13		
C(BP)	01		01		02		02	
C(BF)								
C(TP)								
C(TF)								
C(PF)								
Third order:								
C(BTP)	01	01	01		04	04	04	
C(BTF)	01	01		01	01	01		01
C(BPF)								
C(TPF)								
Fourth order: C(BTPF)								
R^2 for a single set of Variables	24	06	03	01	46	20	07	01

	Grade level							
	9th				12th			
Commonality coefficients	B	T	F	T	B	T	F	T
First order:								
U(B)	45				06			
U(T)		05				12		
U(P)			03				07	
U(F)				01				03
Second order:								
C(BT)	02	02			09	09		
C(BP)	02		02		01		01	
C(BF)	01			01	01			−01
C(TP)		03	03			02	02	
C(TF)						03		03
C(PF)							02	−02
Third order:								
C(BTP)	01	01	01		−01	−01	−01	
C(BTF)	02	02		02	03	03		03
C(BPF)					01		−01	01
C(TPF)						−01	−01	−01
Fourth order: C(BTPF)					02	02	02	02
R^2 for a single set of variables	52	12	07	03	20	28	09	08

[1] Rounded to 2 places of decimals with leading decimal points deleted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 26; 6th, 49; 9th, 63; 12th, 44. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

Table 5.4.2.2.—Squared Multiple Correlations [1] of B, T, P, and F With Attitude Toward Life, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Grade level							
	3d				6th			
Commonality coefficients [2]	B	T	P	F	B	T	P	F
First order:								
U(B)	18				29			
U(T)		04				01		
U(P)			01					
U(F)								
Second Order:								
C(BT)	01	01			20	20		
C(BP)					01	01		
C(BF)								
C(TP)								
C(TF)								
C(PF)								
Third order:								
C(BTP)	01	01	01		05	05	05	
C(BTF)					02	02		02
C(BPF)								
C(TPF)								
Fourth order: C(BTFP)								
R^2 for a single set of Variables	22	06	04	01	57	28	06	02

	Grade level							
	9th				12th			
Commonality coefficients	B	T	P	F	B	T	P	F
First order:								
U(B)	29				14			
U(T)		01				03		
U(P)			01				01	
U(F)				01				01
Second order:								
C(BT)	17	17			22	22		
C(BP)	02		02					
C(BF)								
C(TP)								
C(TF)								
C(PF)			01	01			02	02
Third order:								
C(BTP)	05	05	05		06	06	06	
C(BTF)	02	02		02	04	04		04
C(BPF)	02		02	02				
C(TPF)		01	01	01				
Fourth order: C(BTFP)	03	03	03	03	03	03	03	03
R^2 for a single set of variables	58	29	15	08	48	38	12	09

[1] Rounded to 2 places of decimals with leading decimal points deleted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 27; 6th, 58; 9th, 64; 12th, 56. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

coefficients that involve *B* and *T* (viz, *BTP* and *BTF*) show that at grades nine and 12 there is an increase in the amount of predictable variance shared by all four sets of variables. The squared multiple correlations are greatest for *B* and *T*, but increase for the other sets at the higher grade levels. Taken together, these trends suggest that *B* may be more important in the development of Attitude Toward Life, but that *T* may come to share in this role at the higher grade levels. If other aspects of the school such as *F* and *P* are found to play a role, it is only through their sharing of variance with *B* and *P*.

The four-set commonalities for Educational Plans and Desires are given in table 5.4.2.3. Inspection of the unique portions for the different grade levels shows that *B* has the largest values, but that the unique portions for *T* increase at the higher grade levels. At grade 12 there is an appreciable unique portion of *P*. The second-order commonality coefficients are largest for *B* and *T*. However, none of the other second-order commonalities have appreciable values or show a clear trend. For the individual sets of variables, the squared multiple correlations are greatest for *B* and *T*; for the higher grade levels, *P* remains relatively stable, while *F* shows a slight increase. It seems that *B* may be most important in the development of Educational Plans and Desires, but that *T* may also make a contribution.

Table 5.4.2.4 gives the four-set commonalities for Study Habits. The unique portions show that by far the greatest independent contribution to the prediction of Study Habits is from *B*. The only second-order common-

Table 5.4.2.3.—Squared Multiple Correlations [1] of B, T, P, and F With Educational Plans and Desires, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Grade level							
	3d				6th			
Commonality coefficients [2]	B	T	P	F	B	T	P	F
First order:								
U(B)	07				19			
U(T)		02				01		
U(P)			01				01	
U(F)								
Second order:								
C(BT)	08	08			21	21		
C(BP)					01		01	
C(BF)								
C(TP)								
C(TF)								
C(PF)								
Third order:								
C(BTP)	03	03	03		07	07	07	
C(BTF)					01	01		01
C(BPF)								
C(TPF)								
Fourth order:								
C(BTPF)								
R^2 for a single set of variables	19	13	04	01	50	31	09	01

	Grade level							
	9th				12th			
Commonality coefficients	B	T	P	F	B	T	P	F
First order:								
U(B)	35				19			
U(T)		03				09		
U(P)			01				03	
U(F)				01				01
Second order:								
C(BT)	14	14			20	20		
C(BP)	01		01		02		02	
C(BF)	01			01				
C(TP)						−01	−01	
C(TF)		01		01		02		02
C(PF)								
Third order:								
C(BTP)	08	08	08		03	03	03	
C(BTF)	02	02		02	02	02		02
C(BPF)	01		01	01				
C(TPF)						01	01	01
Fourth order: C(BTPF)	−01	−01	−01	−01	01	01	01	01
R^2 for a single set of variables	61	28	10	04	47	37	10	06

[1] Rounded to 2 places of decimals, with leading decimal points deleted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 21; 6th, 52; 9th, 67; 12th, 61. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

Table 5.4.2.4.—Squared Multiple Correlations [1] of B, T, P, and F With Study Habits, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Grade level							
	3d				6th			
Commonality coefficients [2]	B	T	P	F	B	T	P	F
First order:								
U(B)	17				31			
U(T)		01				01		
U(P)			01				01	
U(F)								
Second order:								
C(BT)	22	22			19	19		
C(BP)	01		01		01		01	
C(BF)								
C(TP)		01	01					
C(TF)								
C(PF)								
Third order:								
C(BTP)	07	07	07		05	05	05	
C(BTF)	01	01		01	01	01		01
C(BPF)								
C(TPF)								
Fourth order: C(BTPF)								
R^2 for a single set of variables	49	34	11	02	57	26	07	01

	Grade level							
	9th				12th			
Commonality coefficients	B	T	P	F	B	T	P	F
First order:								
U(B)	58				40			
U(T)		02				08		
U(P)			01				03	
U(F)								04
Second order:								
C(BT)	08	08						
C(BP)	01		01		−01		−01	
C(BF)					−01			−01
C(TP)						01	01	
C(TF)								
C(PF)							−01	−01
Third order:								
C(BTP)	03	03	03		02	02	02	
C(BTF)	01	01		01	−01	−01		−01
C(BPF)	01		01	01	01		01	01
C(TPF)						−02	−02	−02
Fourth order: C(BTPF)	02	02	02	02	02	02	02	02
R^2 for a single set of variables	74	16	08	05	42	11	06	03

[1] Rounded to 2 places of decimals, with leading decimal points deleted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 53; 6th, 60; 9th, 78; 12th, 56. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

ality coefficient that shows an appreciable value is $C(BT)$. The trend is for B, T, and P to share less of the predictable variance as one ascends the grade levels. All four sets of variables come to share some of the common variance at the ninth and 12th grades, as can be seen from the fourth-order commonalities. The relative magnitudes of the squared multiple correlations for the individual sets remain roughly similar. These trends suggest that B comes to play an increasingly greater role in the development of Study Habits, and that this role is shared less and less by T.

Four-set commonality analyses for Achievement are given in Table 5.4.2.5. Inspection of the unique portions in this table shows that B makes a slightly greater independent contribution to the predictability of Achievement at the higher grade levels, but tapers off at the 12th grade. A diminishing role is played by T at the higher grade levels. The fact that the unique portion is so high at the lower grade levels is somewhat puzzling until one observes that the second-order commonality coefficient, $C(BT)$, increases for the higher grade levels. This suggests that T comes to share more of the predictable variance in Achievement at the higher grade levels instead of making an independent contribution. The remaining second-order commonalities are negligible in magnitude. The variables we have called F, with P and B, share an increasing amount of variance at the ninth and 12th grades. Similarly, all four sets of variables come to share an appreciable portion of the predictable variance at grades nine and 12. The squared multiple correlations for the individual sets increase in absolute value at the higher grade levels. The relative ordering, however, is for B to be slightly to appreciably larger than T, and for T to be larger than F—until the 12th grade. These results suggest that B and T may play an important role in the development of Achievement. If P and F play a role, it would be by virtue of their shared variances with B and T.

Table 5.4.2.5.—Squared Multiple Correlations [1] of B, T, P, and F With Achievement, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Grade level							
	1st				3d			
Commonality coefficients [2]	B	T	P	F	B	T	P	F
First order:								
U(B)	05				07			
U(T)		06				03		
U(P)			02					
U(F)								
Second order:								
C(BT)	28	28			35	35		
C(BP)					01		01	
C(BF)								
C(TP)								
C(TF)								
C(PF)								
Third order:								
C(BTP)	07	07	07		08	08	08	
C(BTF)	02	01		01	02	02		02
C(BPF)								
C(TPF)								
Fourth order: C(BTPF)	01	01	01	01				
R^2 for a single set of variables	43	43	11	02	53	48	09	02

	Grade level											
	6th				9th				12th			
Commonality coefficients	B	T	P	F	B	T	P	F	B	T	P	F
First order:												
U(B)	10				11				08			
U(T)		03				02				02		
U(P)			01				01				02	
U(F)												
Second order:												
C(BT)	55	55			49	49			45	45		
C(BP)					01		01		01		01	
C(BF)												
C(TP)		01	01			01	01					
C(TF)												
C(PF)												
Third order:												
C(BTP)	12	12	12		12	12	12		07	07	07	
C(BTF)												
C(BPF)	02	02		02	03	03		03	17	17		17
C(TPF)					01		01	01	01		01	01
Fourth order: C(BTPF)					06	06	06	06	04	04	04	04
R^2 for a single set of variables	79	72	14	02	82	72	22	10	82	74	14	22

[1] Rounded to 2 places of decimals, with leading decimal points deleted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 1st, 52; 3d, 56; 6th, 83; 9th, 87; 12th, 86. The number of schools are: 1st, 1,302; 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

Table 5.4.2.6 gives the squared multiple correlations and commonality coefficients for B, T, P, and F with Percent Going on to College or to Postsecondary Vocational Training and Percent of Dropouts. Inspection of table 5.4.2.6 shows that the fourth-order commonality coefficients are near zero for each of the dependent variables. The second noteworthy aspect of this table is that the differences in the commonality coefficients for Percent Going on to College seem to resemble those of Achievement. Unlike Achievement however, T has a larger unique portion than B. These results show that the greatest independent contribution to the Percent Going on to College is made by T. In addition, B makes an independent contribution, as well as sharing variance with T.[17]

The remaining variables have in common that at least one, and usually more than one, of the sets of School variables have a greater unique portion than B. For Percent of Nonwhite Going on to College all three sets of School variables have low-to-moderate unique portions. The higher order commonality coefficients are vanishingly small, except for the second-order commonality, $C(TPF)$, for School Personnel, Pupil Programs and Facilities. In similar fashion, the three sets of School variables have low-to-moderate unique portions for Percent Going on to Postsecondary Vocational Training. The second- and third-order commonalities are negligible except for T and P.

A somewhat similar trend can be noted for Percent of Boy Dropouts. The largest unique portion belongs to T, while P has a value that is about one-third of School Personnel. In addition, the Student Body variables have a value that is about half of the Pupil Programs unique portion. The only appreciable second-order commonality involves B and T.

[17] See following paragraphs and p. 38, for the specific school personnel variables related to Percent Going on to College.

Table 5.4.2.6.—Squared Multiple Correlations[1] of B, T, P, and F With the 12th-Grade Outcome Measures, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

	Dependent variable							
	Percent going on to college				Percent nonwhite going on to college			
Commonality coefficients[2]	B	T	P	F	B	T	P	F
First order:								
U(B)	06				03			
U(T)		12				08		
U(P)			01				04	
U(F)				01				03
Second order:								
C(BT)	21	21			−01	−01		
C(BP)					01		01	
C(BF)					01			01
C(TP)		03	03			02	02	
C(TF)		02		02		01		01
C(PF)								
Third order:								
C(BTP)	03	03						
C(BTF)	06	06		06	01	01		01
C(BPF)					01		01	01
C(TPF)						02	02	02
Fourth order: C(BTPF)	01	01	01	01				
R^2 for a single set of variables	38	49	09	11	05	11	08	07

	Dependent variable											
	Percent going on to vocational training				Percent nonwhite going on to vocational training				Percent of boys who drop out			
Commonality coefficients	B	T	P	F	B	T	P	F	B	T	P	F
First order:												
U(B)	01				02				03			
U(T)		05				07				14		
U(P)			13				08				05	
U(F)				04				04				01
Second order:												
C(BT)	01	01			01	01			04	04		
C(BP)									02		02	
C(BF)												
C(TP)		02	02			03	03			01	01	
C(TF)		01		01		01		01				
C(PF)			−02	−02			−01	−01			01	01
Third order:												
C(BTP)	−01	−01	−01						03	03	03	
C(BTF)	01	01		01	02	02		02				
C(BPF)					01		01	01				
C(TPF)		03	03	03						03	03	03
Fourth order: C(BTPF)												
R^2 for a single set of variables	02	11	14	06	05	11	10	05	10	25	12	04

[1] Rounded to 2 places of decimals, with leading decimal points deleted.

[2] The squared multiple correlations obtained when all 4 sets are entered into regression are: Percent Going on to College, 57; Percent Nonwhite Going on to College, 23; Percent Going on to Vocational Training, 27; Percent Nonwhite Going on to Vocational Training, 24; Percent Boy Dropouts, 34; 780 schools were included in these analyses.

It may be objected that these results are due merely to the groupings of variables that were used. Recognizing that there may be some validity to this argument, we saw that analyses for the two-set case of School and Student Body variables were presented first. We felt that agreement could be reached more readily on a classification of variables into School and Student Body indices. It appears, then, that the use of subsets of School variables is a special case of the more general two-set case, and that any arbitrary division of the set of School variables would not alter the results obtained for this general case. Factor analyses [18] were also conducted on these variables at the different grade levels in order to see if they formed any meaningful groupings. Most of them did not.

[18] I.e., Principal Components analyses and Varimax rotations.

5.5. POSSIBLE CAUSAL INFERENCES

In this chapter we attempted to determine the relative roles of student characteristics and school characteristics as they relate to different school outcomes such as Achievement. A set of Student Body Social Background variables (B) was selected. So were a comprehensive set of 31 School variables (S) and a set of outcome variables.

Before regressions were computed the intercorrelations of the outcome measures were inspected as well as their correlations with B, and the multiple correlations of S with each of them. These correlations showed that both B and S were moderately to highly correlated with the Outcome measures, as well as with one another. We inferred from this that when the schools were equated for the kinds of students they got initially, there would be very few differences left that could be related to S. Calculation of the regressions showed that this was so, and that the percent of variance in most of the Outcome measures associated with S that was independent of B was relatively small, except for Achievement. In the case of Achievement, the percent of variance in the Outcome measures that was independently associated with either B or S was small. This confirmed what we had found earlier by inspecting the intercorrelations, namely that a high degree of correlation existed between B and S as they related to most of the different outcome measures.

In view of these results the special technique was developed that we have labeled "commonality analysis." Regression and commonality analyses were conducted for two and four sets of variables. These analyses were conducted in order to obtain answers to the question: How much of the predictable variance in our measures of School Outcomes can be uniquely apportioned to each set of variables, and how much is common to the different combinations of the sets under consideration? For the two-set case, S and B were used. For the four-set case, B, T, P, and F were used. A summary of the resultant analyses is given below.

To make causal inferences from such associational data it is necessary to make certain assumptions concerning the meaning of results obtained from a commonality analysis. It does not seem unreasonable to assume that some degree of proportionality exists between the percent of variance of a dependent variable that can be uniquely associated with a set of variables and its causal influence. This possible influence will be called an "independent role" or "independent contribution."

It is not as easy, however, to assign some causal interpretation to the common portions of variance. In one sense this shared variance between two or more sets of variables represents an indeterminate situation; we simply cannot tell to which of the sets the variance should be apportioned nor the extent to which these might represent certain kinds of joint occurrences. For example, schools with a high incidence of disciplinary problems

may have certain kinds of policies for handling these problems, whereas schools with a low incidence of such problems may not need a formal disciplinary system for handling them. This is not to say that these are necessary joint occurrences, but only that they may be found together in schools as they have developed up to this point in time.

The following inferences are organized around the different outcome measures.

Expectations for Excellence.—The Student Body and School variables were both found to play increasingly large independent roles in Expectations at the higher grade levels. Up to the 12th grade, the Student Body variables play a much greater role than the School variables. At the 12th grade, however, there occurs a sharp reversal in their relative roles: the School variables now make a much greater contribution than the Student Body variables. Of the School variables, those that play an increasingly greater role at the higher grade levels are the ones we have called *T*, *P*, and *F*.

Attitude Toward Life.—The independent role of the Student Body variables in Attitude Toward Life increases at the higher grade levels and then drops off slightly at grade 12. The independent role of the School variables shows a progressive increase from grade six on. The measure of overlap increases at the higher grade levels. This suggests that the longer the Student Body and School variables are associated with one another as part of the educational process, the more their common role in the development of Attitude Toward Life tends to increase.

Educational Plans and Desires.—The Student Body variables play a greater independent role in the development of Educational Plans and Desires than do the School variables. However, the School variables play an increasingly greater independent role at the higher grades. The measure of overlap suggests that the Student Body and School variables have a common role in the development of Educational Plans and Desires. The School Personnel variables play an increasingly greater independent role at the higher grade levels, as well as a common role with the Student Body variables. The Pupil Programs have a common role in combination with the Student Body and School variables.

Study Habits.—The Student Body variables play an increasingly greater independent role in the development of Study Habits at the higher grade levels. The School variables also play a greater independent role at the higher grade levels, but their relative contribution is much less than for the Student Body variables. The progressive decline in the magnitude of the measure of overlap at the higher grade levels suggests that, at the higher grade levels, the Student Body and School variables may have increasingly less of a common role in influencing Study Habits. The three subsets of School variables show a slight increase in their independent role at the higher grade levels. However, the common role of the School Personnel and Student Body variables diminishes at the higher grade levels, as does their common role with the Pupil Program and Policy variables.

Achievement.—The independent role of the School variables in Achievement is greater than for the Student Body variables at the first grade. However, at the third grade these roles are reversed. From the third grade on the Student Body variables play a greater independent role than the School variables. The measure of overlap shows a progressive increase from the first through the 12th grades. At the higher grades most of the predictable variance in Achievement is shared with the Student Body and School variables. None of the subsets of School variables play much of an independent role at the higher grade levels. In fact the School Personnel set shows a diminishing independent role at the higher grade levels. The School Personnel variables have a large common role with the Student Body variables. This may have an influence on Achievement. Likewise, the Pupil Programs and Facilities may be making a contribution through their common role with the Student Body and School Personnel variables. These trends, juxtaposed with other considerations, suggest that white students and students from higher socioeconomic strata acquire more knowledge from their school experiences than do nonwhite students or students from lower socioeconomic strata. Moreover, the schools appear to play a role in influencing these differences.

This line of reasoning is supported, in part, by tables 5.2.1 and 5.3.2.1, which show that the intercorrelations of the Student Body variables are fairly similar for all grade levels. These tables also show that the multiple correlations of the School variables with each of the Student Body variables are fairly similar. However, the correlations of the Student Body and School variables with Achievement increase for the higher grade levels.

We also know from other analyses that when the achievement curves of white students are compared with those of nonwhite students they show an initial gap, and that this gap increases at the higher grade levels (Coleman et. al., 1966; Okada et. al., Technical Notes 53 and 54). Still other analyses following up the same students over time have shown that, after students had been equated for initial ability, high SES students learned more than low SES Students (Shaycoft, 1967). Table 4.2 also showed that there is a pronounced tendency for students of similar racial and socioeconomic backgrounds to go to school with one another. This aggregation of similar kinds of students into the same schools masks the differences that exist among students within each school, and therefore makes the school averages more predictable. This greater predictability results in the high correlations that can be observed between such variables as Socio-Economic Status, Racial-Ethnic Composition and Achievement. Part of this increase in correlation with Achievement for the higher grade levels is attributable to the influence of the schools.

Twelfth-Grade Outcome Measures.—For the remaining outcome measures the School variables make a much larger independent contribution than do the Student Body

variables. Indeed, the role of the Student Body variables is often negligible. The School Personnel variables have a relatively large independent and common role, primarily with the Student Body variables, but also with the Pupil Program and Facilities variables. The Student Body variables play an independent as well as a common role in Percent Going on to College. It appears, however, that the School Personnel set of variables may play the largest role in influencing Percent Going on to College.

For the remaining variables each of the three subsets of School variables [19] plays a greater independent role than the Student Body variables. There is very little of a common role for these variables except for the School Personnel and Pupil Program sets. For the most part, the three sets of school variables tend to contribute independently of one another. For Dropouts, however, there is a slight common role for the Student Body and School Personnel variables with the Facilities and Pupil Programs variables, respectively.

SUMMARY

We have seen that the Student Body Social Background variables may play a moderate-to-large role in influencing Expectations for Excellence, Attitude Toward Life, Educational Plans and Desires and Study Habits. The School variables also play a role, but not nearly as large a one as the Student Body variables. We have also seen that a certain amount of variance is shared by these two sets of variables and that the extent of this sharing varies with the grade level and the school outcome under consideration.

For Achievement we have seen that the Student Body and School variables each play relatively small independent roles. But there is a dramatic confounding and perhaps interplay of these variables. These results suggest that the kinds of students a school gets initially, as well as its resources, play a role in influencing School outcomes. It is suggested that for all of the outcome measures the school fosters more learning and motivation in white students and students from the higher socioeconomic strata.

For the remaining outcome measures the school variables play a much greater independent role than the student body variables. Perhaps by the time students reach the 12th grade the school has more of an influence than at the lower grade levels. The next chapter will present partial correlations of the school variables with these outcome measures in an attempt to pinpoint the specific kinds of variables that might have a causal influence.

[19] With the exception of Facilities for Dropouts.

6. Partial Correlations of Selected School Descriptive Variables With Outcome Measures

This chapter presents a series of partial correlations in summary form.[1] The partial correlations in question are those of the different outcome measures with the individual regressor variables, after certain other correlations had been eliminated.[2] They are presented in order to show what kinds of variables are related to the various outcome measures and to what extent. The advantage of partial correlations for this purpose is that they are more readily interpretable than regression coefficients because their magnitude and sign depend only upon the few variables that have been partialed out. In addition, they are often the desired end product of an analysis. The reason for this is that they describe a number of different relationships between the regressor and dependent variables that can be utilized after the association attributable to some other variable has been removed.[3] Finally, partial correlations can give the reader a view of the data that differs somewhat from one afforded by regression analyses.

The summary tables are organized by the various outcome measures for each grade level. Each table was developed from the relevant series of detailed tables in appendix XI, where separate treatment is given to the effects at each stage of partialing out first Size, then Home Background, and finally Racial-Ethnic Composition. The tables in appendix XI also show the zero-order correlations (when no other variables are partialed out), and the squared multiple correlations of the variables partialed out with the dependent variable, for each grade level. These results are summarized here by the device of using an "X" to represent variables that had a residual or partial correlation of 0.09 or greater,[4] after Size, Home Background, and Racial-Ethnic Composition had been partialed out. The value of .09 was chosen because each variable presented with the use of this cutoff had about one percent of the residual variance associated with it (that is, about 0.09 squared).

A word of caution may be appropriate here. It can be expressed in the form of an example. At the ninth grade about 36 percent of the total variance in Achievement is associated with the schools (see table 4.2). Of this 36 percent, 82 percent is accounted for by partialing out Size, Home Background, and Racial-Ethnic Composition (see appendix XI). The remainder—a mere 18 percent—can be explained by other variables. Now this 18 percent of the 36 percent becomes the base from which we are working when we look at the partial correlations that remain after Size, Home Background, and Racial-Ethnic Composition have been partialed out. As the following calculations show, 1 percent of this remaining variance —our cutoff point—is indeed a very small fraction of the variance associated with the schools, let alone of the total Achievement variance.

Total Achievement variance associated with the schools = 0.36

Unexplained school Achievement variance, i.e., the total Achievement variance associated with the schools that is left unexplained after partialing out Size, Home Background and Racial-Ethnic Composition = 1 − 0.82 = 0.18.

Proportion of unexplained school Achievement variance that is associated with one variable is at least one percent (viz, 0.09 squared) = 0.01

Proportion of unexplained school Achievement variance that is accounted for by a single variable having a partial correlation of 0.09 = 0.18 × 0.01 = 0.0018

Proportion of Total Achievement variance that is accounted for by a single variable having a partial correlation of 0.09 with the unexplained school Achievement variance = 0.0018 × 0.36 = 0.000648, or approximately 0.001.

Hence it can be seen that even though a variable can have what appears to be a relatively large partial correlation, the actual proportion of variance in a school Outcome measure that it can account for can be very small. The amount of Total variance it can account for may be even smaller.

6.1. PARTIAL CORRELATIONS OF STUDENT BODY'S EXPECTATIONS FOR EXCELLENCE

It will be seen from table 6.1.1 that after Size, Student Body Home Background and Racial-Ethnic composition had been partialed out, the following variables maintained a residual correlation for two or more grade levels:

Teacher's Racial-Ethnic Group Membership (negatively at grade 12), Contextual Vocabulary Score slightly negative), and Percent of White Students in Class;

Student Body's Educational Plans, Study Habits, Attitude Toward Life, and Achievement Level (with a sign reversal at grade nine);

Proportion of Females in Student Body, whether Parents Speak a Foreign Language at Home or Stu-

[1] For the tables on which these summary tables are based, see appendix XI, under separate cover.

[2] The correlations eliminated were those attributable to school Size (i.e., number of students), Student Body's Socio-Economic Status, Racial-Ethnic Composition, and Family Structure. These variables are described in chapter 4.

[3] See McNemar, 1955, for an excellent introduction to partial correlation techniques.

[4] I.e., greater in absolute value.

Table 6.1.1.—Partial Correlations With Expectations for Excellence [1]

List of variables	Grade levels 12	9	6	3	Total X's
Daily attendance					0
Teaching conditions		X			1
Teacher's racial-ethnic group membership	(−)X	X			2
Contextual vocabulary score	(−)X	(−)X			2
Percent of white students at teacher's undergraduate institution		(−)X			1
Percent white of teacher's students	X	X			2
Student body's educational plans and desires	X	X	X		3
Student body's study habits	X	X	X	X	4
Student body's attitude toward life	X	X	X	X	4
Student body's achievement level		(−)X		X	2
Proportion of females in the student body		X	X	X	3
Parents speak a foreign language at home	X	X	(−)X	X	4
Student speaks a foreign language outside of school	X	X		X	3
Kindergarten attendance	X	X	X	X	4
Nursery school attendance			X	X	2
Total X's	9	13	7	8	37

[1] After partialing out School Size, Student Body's Home Background, and Student Body's Racial-Ethnic Composition.

dent Speaks a Foreign Language Outside of School, and Kindergarten Attendance (i.e., the proportion of children in the student body who attended kindergarten and nursery school)

The sign reversal at the 12th grade for Teacher's Racial-Ethnic Membership may reflect a change that is associated with nonwhite teachers. Perhaps nonwhite teachers at the twelfth grade have a different kind of student (e.g., they have lost the dropouts). The reason for the sign reversal on the Teacher's Vocabulary Score is not so easy to suggest. Perhaps lower scoring teachers tend to produce unrealistically high Expectations. The sign reversal for Achievement may be due to the different variables used to represent these indices at the different grade levels. There is no ready explanation for the sign reversal for English (as opposed to some other language) spoken at home.

6.2. PARTIAL CORRELATIONS OF STUDENT BODY'S ATTITUDE TOWARD LIFE

The variables in table 6.2.1 that maintained a residual relationship for two or more grade levels were:

Pupils Per Room (negatively, indicating more favorable attitudes for fewer pupils per room);

Student Body's Expectations, Educational Plans, Study Habits, and Achievement Level;

Proportion of Females in Student Body, and Proportion of Students Who Speak English (as opposed to some other language) Outside of School and at Home;

Kindergarten Attendance, and Frequency of Parents' PTA Attendance (as reported by the child).

Table 6.2.1.—Partial Correlations With Attitude Toward Life [1]

List of variables	Grade levels 12	9	6	3	Total X's
Pupil-teacher ratio	(−)X				1
Pupils per room	(−)X	(−)X			2
Compulsory attendance law					0
Daily attendance	X				1
Teaching conditions			(−)X		1
Teacher's preference for student ability level	X				1
Teacher's racial-ethnic group Membership				(−)X	1
Contextual vocabulary score					0
Percent of white students at teacher's undergraduate Institution				(−)X	1
Percent white of teacher's students		(−)X			1
Student body's expectations for excellence		X	X	X	3
Student body's educational plans and desires	X	X	X	X	4
Student body's study habits	X	X	X	X	4
Student body's achievement level	X	X	X		3
Proportion of females in the student body			X	X	2
Parents speak a foreign language at home	X	X		X	3
Student speaks a foreign language outside of school	X	X		X	3
Kindergarten attendance		X	X		2
Nursery school attendance			X	X	2
Frequency of parents' PTA attendance	X	X			2
Total X's	10	10	8	9	37

[1] See footnote to table 6.1.1.

6.3. PARTIAL CORRELATIONS OF STUDENT BODY'S EDUCATIONAL PLANS AND DESIRES

Only those variables that appeared at two or more grade levels are discussed in this section. As can be seen from table 6.3.1, these variables are:

Specialized Staff and Services (with a slight negative value);

Table 6.3.1.—Partial Correlations With Educational Plans and Desires [1]

List of variables	Grade levels 12	9	6	3	Total X's
Specialized staff and services	(−)X	(−)X			2
Principal's estimate of the school's reputation					0
Daily attendance	X	X			2
Teaching conditions	X	X			2
Teacher's socio-economic background	(−)X				1
Teacher's Preference for student ability level	X				1
Teacher's racial-ethnic group membership					0
Contextual vocabulary score	(−)X				1
Percent of white students at teacher's undergraduate institution					0
Percent white of teacher's students					0
Student body's expectation for excellence	X	X	X	X	4
Student body's study habits	X	X	X	X	4
Student body's attitude toward life	X	X	X	X	4
Student body's achievement level	X	X	X	X	4
Proportion of females in the student body	(−)X		X	X	3
Parent's speak a foreign language at home				X	1
Student speaks a foreign language outside of school				X	1
Kindergarten attendance	(−)X			X	2
Nursery school attendance			X	X	2
Total X's	12	7	6	9	34

[1] See footnote to table 6.1.1.

Percent of Students in Daily Attendance;

Teaching Conditions (i.e., the teachers' view of the student body as to how much effort they put forth, school problems, etc.);

Student Body's Expectations, Study Habits, Attitude Toward Life, and Achievement Level;

Proportion of Females in the Student Body (with a sign reversal at the 12th grade);

Nursery School Attendance.

The negative sign for Specialized Staff and Services may indicate that, although the student body requires specialized staff (remedial reading and math teachers, etc.), and although these specialists may produce more Achievement (see table 6.5.1), the students may have fewer plans to continue on in school. The sign reversal for Proportion of Females at the 12th grade is not readily explained.

6.4. PARTIAL CORRELATIONS OF STUDENT BODY'S STUDY HABITS

It will be seen from table 6.4.1 that the following regressor variables retained a residual relationship of .09 or greater at two or more grade levels:

Student Body's Expectations, Educational Plans, Attitude Toward Life, and Achievement Level (with a sign reversal at grade 12);

Proportion of Females in Student Body and proportion of students who speak English as opposed to some other language;

Kindergarten and Nursery School Attendance and Parents' PTA Attendance (as reported by the student).

Table 6.4.1.—Partial Correlations With Study Habits [1]

List of variables	Grade levels 12	9	6	3	Total X's
Compulsory attendance law				X	1
Daily attendance	X				1
Teaching conditions					0
Teacher's preference for student ability					0
Teacher's racial-ethnic group membership				X	1
Contextual vocabulary score				X	1
Percent of white students at teacher's undergraduate Institution				X	1
Percent white of teacher's students	(−)X				1
Student body's expectations for excellence	X	X	X	X	4
Student body's educational plans and desires	X	X	X	X	4
Student body's attitude toward life	X	X	X	X	4
Student body's achievement level	(−)X		X	X	3
Proportion of females in the student body	X	X	X	X	4
Parents speak a foreign language at home	X	X		X	3
Student speaks a foreign language outside of school	X	X		X	3
Kindergarten attendance		X		X	2
Nursery school attendance			X	X	2
Frequency of parents' PTA attendance	X	X			2
Total X's	9	9	6	13	37

[1] See footnote to table 6.1.1.

The sign reversal for Achievement at the 12th grade may indicate that the lower achieving students who remain in school (as opposed to the dropouts) report more studious habits than do the higher achieving students.[5] This line of reasoning is supported by the fact that Achievement is negatively related to the Percent of Dropouts (see appendix XI).

6.5. PARTIAL CORRELATIONS OF SCHOOL ACHIEVEMENT LEVELS

Table 6.5.1 shows that the following variables maintained a residual relationship for two or more grade levels:

Specialized Staff and Services, Pupil-Teacher Ratio, (negatively, indicating higher achievement levels for fewer pupils per teacher), Teacher Exams, or the use of teacher examinations in the appointment process (also negatively), and the enforcement of a Compulsory Attendance Law;

Teaching Conditions, Teacher's Racial-Ethnic Group Membership, Annual Teaching Salary, Contextual Vocabulary Score, and College Attended;

Percent of White Students at Teacher's Undergraduate Institution, and Percent of White Students

Table 6.5.1.—Partial Correlations With Achievement [1]

List of variables	Grade levels 12	9	6	3	1	Total X's
Specialized staff and services	X	X	X	X	X	5
Availability of texts						0
Pupil-teacher ratio		(−)X	(−)X			2
Principal's estimate of the school's reputation						0
Teacher exams			(−)X		(−)X	2
Principal's estimate of school problems						0
Compulsory attendance law	X	X				2
Pupil assignment					X	1
Daily attendance				X		1
Teaching conditions	X	X	X	X	X	5
Teacher's socio-economic background						0
Teacher's college attended		X	X			2
Teaching related activities						0
Teacher's preference for student ability level						0
Teacher's racial-ethnic group membership		X	X			2
Annual teaching salary	X	X	X		X	4
Contextual vocabulary score		X	X	X	X	4
Percent of white students at teacher's undergraduate institution		X	X			2
Percent white of teacher's students		(−)X			X	2
Student body's expectations for excellence		(−)X				1
Student body's educational plans and desires	X	X	X	X		4
Student body's study habits	(−)X		X	X		3
Student body's attitude toward life	X	X	X			3
Proportion of females in the student body	(−)X	(−)X				2
Parents speak a foreign language at home	(−)X	(−)X				2
Student speaks a foreign language outside of school		(−)X	X			2
Kindergarten attendance	X	X	X	X	X	5
Total X's	10	17	14	7	8	56

[1] See footnote to table 6.1.1.

[5] This would require that similar kinds of students be aggregated in schools with one another—as, indeed, has been shown to be the case (see table 4.2).

in Teacher's Class (with a sign reversal at the 12th grade);

Student Body's Attitude Toward Life, Proportion of Females in Student Body (negatively, indicating higher achievement levels for a higher proportion of males), Kindergarten Attendance, and the proportion of students whose parents speak English at home (negatively).

The negative sign for Teacher Exams may indicate that it is the schools with lower achieving students that use teacher exams in the appointment process in order to keep out unfit teachers. Or it may be that those teachers who are best able to produce achievement in their students are in such demand that they do not have to subject themselves to an examination procedure. The reason for the sign reversal in Percent of White Students in Teacher's Class is not readily apparent. The same is true of Parents Speak a Foreign Language at Home. The sign reversal for Study Habits may reflect in part the influence of the dropouts (see p. 37).

6.6. PARTIAL CORRELATIONS FOR THE SPECIAL 12TH-GRADE OUTCOME MEASURES

The partial correlations for the special 12th-grade outcome measures—Percent of 12th-Grade Graduates Going on to a 2- or 4-Year College, Percent of 12th-Grade Graduates Going on to Postsecondary Vocational Training, and Percent of Boy Dropouts[6]—are given in appendix XI. Here, instead of a single summary table, each set of results will be summarized separately.

The partial correlations for Percent of 12th-Grade Graduates Going on to a 2- or 4-Year College showed that the following regressor variables retained a residual relationship:

Plant and Physical Facilities, Number of Hours Homework Expected Per Day, and Percent of Boy Dropouts (negatively, indicating that schools with a higher percent of students going on to college have fewer dropouts);

Teaching Conditions and Teacher's Preference for High-Ability Students;

Student Body's Attitude Toward Life, Educational Plans and Desires, and Achievement Level.

The partial correlations for Percent of 12th-Grade Nonwhite Graduates Going on to a 2- or 4-Year College showed that the following variables retained a residual relationship:

Percent of Nonwhites Going on to Vocational Training and Number of Years Since Nonwhites Entered the School;

Age of Building (negatively, which indicates more nonwhites going on to college from the newer schools);

Teacher's Training, Teacher's Assignment to Present School (negatively, which indicates that the teachers are assigned to the school), and Percent of White Students in Teacher's Class (negatively, indicating that there is a tendency for there to be more nonwhites in the classrooms of schools that have more nonwhites going on to college).

The partial correlations for Percent of 12th-Grade Graduates Going on to Postsecondary Vocational Training showed that the following variables retained a residual relationship:

Instructional Facilities, Specialized Staff and Services, and Pupil-Teacher Ratio.

The partial correlations for Percent of 12th-Grade Nonwhite Graduates Going on to Postsecondary Vocational Training showed that the only variable retaining a residual relationship was Percent of Nonwhite Going on to College.

The partial correlations for Percent of Dropouts showed that the following regressor variables retained a residual relationship:

Tracking and Ability Grouping;

Availability of Texts (negatively, which indicates fewer texts available in adequate numbers);

Percent Going on to College (negatively, which indicates either that higher dropout schools have fewer students going on to college or that a college-bound orientation on the part of the students may play a role in having a small number of dropouts);

Teacher Examinations, Scope and Severity of School Problems, percent of students in Daily Attendance;

Teaching Conditions (negatively, which indicates that the teachers feel the students put forth little effort to achieve, there are many school problems, etc.);

Teacher's Preference for High-Ability Students (negatively, which indicates either that schools with many dropouts have few teachers who prefer high-ability students, or that the teacher's preference for high-ability students plays a role in having fewer dropouts);

Teacher's Racial-Ethnic group membership (which indicates that schools with predominantly white teachers tend to have more dropouts than schools with predominantly nonwhite teachers);

Teacher's Assignment to Present School (negatively, which indicates that higher dropout schools are more likely to have teachers who did not choose the school but were assigned to it);

Student Body's Attitude Toward Life (negatively, which indicates that a less favorable attitude toward life on the part of the student body is associated with a higher proportion of dropouts).

SUMMARY

We saw in chapter 5 that the school variables and student body variables became more and more interrelated (or correlated) with some of the outcome measures over

[6] Percent of Girl Dropouts was eliminated from the analyses because it had a correlation of 0.87 with Percent of Boy Dropouts.

the different grade levels. This effect was most noticeable in the case of Attitude Toward Life, Study Habits, and Achievement. Consequently, the influence of many school variables may be bound up with the nature of the students. To the extent that this is so, the students' role in the school outcomes would *not* be revealed in an analysis of this nature. This is an extremely important point, and one that must be borne in mind in the following summaries of the partial correlational analyses.

Expectations for Excellence.—The regressor variables that appear to play a role in Expectations for Excellence, independently of the social background of the student body, are:

> Teacher's Vocabulary Score (a slight negative value, indicating either that the students with higher expectations tend to have lower scoring teachers or that lower scoring teachers may play a role in producing higher expectations which might even be unrealistic);
>
> Percent White of Teacher's Students;
>
> Student Body's Educational Plans and Desires, Study Habits, and Attitude Toward Life;
>
> Proportion of Females in the Student Body, and Kindergarten and Nursey School Attendance.

Attitude Toward Life.—The corresponding variables for Attitude Toward Life appear to be:

> Percent of Graduates Going on to College, Student Body's Expectations, Educational Plans, Study Habits, and Achievement Level;
>
> Proportion of Females in Student Body and proportion of students who speak English (as opposed to some other language) at home and outside of school;
>
> Kindergarten and Nursery School Attendance, and Parents' PTA Attendance.

Educational Plans and Desires.—Specialized Staff and Services plays a slightly negative role in Educational Plans and Desires. This role is independent of the student's social background, which may indicate that specialized staff preponderate in schools where the students are in need of remedial work, but where they do not plan to stay on long in school. Still other variables that play a role are: Percent of Students in Daily Attendance; Percent Going on to College; Teaching Conditions; Student Body's Expectations, Study Habits, Attitude Toward Life, and Achievement Level; and Nursery School Attendance.

Study Habits.—The variables that play an independent role in Study Habits are primarily the Other Outcome measures of: Student Body's Expectations, Educational Plans, Attitude Toward Life; Proportion of Females in Student Body; Kindergarten and Nursery School Attendance; Parents' PTA Attendance; and the proportion of students who speak English (as opposed to a foreign language) at home or outside of school.

Achievement.—The number of variables that appear to play an independent role in Achievement is greater than for the other outcome measures. These variables are: Specialized Staff and Services; Pupil-Teacher Ratio (negatively, indicating higher achievement levels for fewer pupils per teacher); use of Teacher Examinations in the appointment process (negatively, which may indicate either that lower achieving schools use these to keep out less capable teachers, or that the better qualified teachers who are more likely to produce Achievement in their students are in such demand that they do not have to subject themselves to an examination procedure); enforcement of a Compulsory Attendance Law; Percent Going on to College; Teaching Conditions; Teacher's College Attended, Racial-Ethnic Group Membership, Annual Teaching Salary, and Vocabulary Score; Percent of White Students at Teacher's Undergraduate Institution; the Student Body's Educational Plans and Attitude Toward Life; the Proportion of Females in the Student Body (negatively, which indicates a slight tendency for higher achievement levels for a higher proportion of males); Kindergarten Attendance; and proportion of students who speak English as opposed to some other language at home (negatively, which begs a ready explanation).

Percent to College.—The variables that play an independent role in Percent Going on to College are: the Plant and Physical Facilities; amount of Homework Expected; the Percent of Dropouts (negatively, which indicates that schools with a higher percent going on to college have fewer dropouts); teachers feeling that they have more favorable Teaching Conditions, and showing a preference for high-ability students; and Student Body's Educational Plans, Attitude Toward Life and Achievement Level.

Percent Nonwhite to College.—The following variables play a role in Percent Nonwhite Going on to College independently of the social background of the students and the Size of the school: Age of Building (negatively, which indicates that college-going nonwhites come from newer buildings); length of time since Nonwhite Entered the School; Percent Nonwhite Going on to Postsecondary Vocational Training; Teacher's Training; and Percent of White Students in Teacher's Class.

Percent to Vocational (Total and Nonwhite).—The variables that appear to play an independent role in Percent of Graduates Going on to Vocational Training are: Instructional Facilities; Specialized Staff and Services; and Pupil-Teacher Ratio. The only variable that has a role for Percent Nonwhite Going on to Postsecondary Vocational Training is Percent of Nonwhite Students Going on to College.

Percent Dropouts.—The following variables play an independent role in Percent of 10th-Grade Boy Dropouts, (or Girl, since they are highly correlated): Tracking; Availability of Texts (negatively, which indicates fewer texts available in sufficient numbers); use of Teacher Exams in the appointment process; a high rating on Scope and Severity of School Problems (destruction of property, racial tension, etc.); Percent of Students in Daily Attendance (negatively, which indicates that schools with a larger number of dropouts also experience a greater percentage of absences); Percent to College (negatively, which suggests either the presence of many

dropouts reduces the percent going on to college or, conversely, that the presence of a high proportion of college-bound students plays a role in lessening the number of dropouts); less favorable Teaching Conditions; Preference for High-Ability Students (the teachers in schools with a low percentage of dropouts express a preference for high-ability students, which may play a role in reducing the number of dropouts); Teacher's Racial-Ethnic Group Membership (schools with a high percentage of dropouts tend to have more white teachers); the Teacher's Assignment to his Present School (negatively, which indicates that the teacher was placed in the school rather than having voluntarily chosen it); and Attitude Toward Life (negatively, indicating that a more favorable Attitude Toward Life is associated with fewer dropouts).

6.7. POSSIBLE CAUSAL INFERENCES

In many instances it is more difficult to give a causal interpretation to these partial correlations. In some cases it seems one could argue that the causal direction could be either way or both ways. In other cases it seems quite reasonable to suppose that the partial correlation represents both a cause and an effect. For example, a nonwhite teacher is more likely than a white teacher to have attended an undergraduate institution in which the students are predominantly nonwhite, and to have gone from there to a teaching situation in which both the students and the staff are predominantly nonwhite. Now, if there are less stringent requirements in nonwhite institutions and if those who teach in them have a less adequate preparation, then it seems likely that a cycle is set up which will perpetuate itself: poorer preparation of the teachers may result in less Achievement on the part of the students, some of whom in turn may attend predominantly nonwhite undergraduate institutions and then go into nonwhite teaching situations.

The inferences we have chosen to make will be organized around the following groups of variables: those that refer primarily to the school's Physical Facilities; those that refer to the school's Policies and Practices; those that refer to attributes of the school Personnel and Personnel Expenditures; and those that refer to attributes of the Student Body. When the term "social background" is used it refers to the student body's Socio-Economic Status, Family Structure and Racial-Ethnic Composition.

Physical Facilities.—The relationships of Physical Facilities to the outcome measures are conspicuously few. It is not clear why schools with a larger plant and more physical facilities should have a higher percent of students going on to college. However, it is reasonable to expect that schools with many such Instructional Facilities as shops, labs, etc. might be able to involve their students in certain kinds of vocational activities, thereby stimulating them to pursue training beyond high school. The relations of Age of Building to Percent of Nonwhites Going on to College suggests that some of the newer schools are sending more students on to college. But it is not clear why. Perhaps the new schools are located in urban areas where colleges are more accessible. Some of these new schools may even include junior colleges. One interesting result is the negative relationship of Pupils Per Room to Attitude Toward Life. It looks as if fewer Pupils Per Room means more intimacy among the pupils, and that this in turn may have an influence on the development of favorable attitudes. Although such variables as these are related to school outcomes independently of the students' social background and of School Size, the number of relationships is relatively small as we shall see.

Policies and Practices.—Variables relating to a school's Policies and Practices are more numerous than those relating to its Physical Facilities. Nevertheless, relationships between them and the outcome measures are still relatively infrequent. Thus, the practice of tracking and ability grouping has received much attention and discussion. Our analysis, however, showed that it is related only to the Percent of Dropouts. But it is difficult to say to what extent this is a cause and to what extent it is a response to the nature of the student body. If it were playing a causal role one might think it would be related to Achievement.[7] Similarly, the provision of texts in sufficient numbers is related to only one outcome measure, the Percent of Dropouts, and the relationship is a slight one. This may reflect a situation that aggravates or further contributes to the number of dropouts. The Pupil-Teacher Ratio is related negatively to Achievement and positively to the Percent of Graduates Going on to Postsecondary Vocational Training. If this can be regarded as an index of teacher "overload" it suggests that there is less "overloading" in higher achieving schools (which may result in more achievement), and more "overloading" in schools that have many students going on to postsecondary vocational training. Similarly, the fact that Teacher Exams is related negatively to Achievement and positively to Percent of Dropouts suggests either that the better teachers (who might produce more Achievement) seek out situations where they do not have to take exams, or that the lower achieving, high dropout schools have to use Teacher Exams as a screening device, presumably because they have difficulty getting qualified teachers.

In conclusion, we must admit that, as with the facility variables, relationships between the policy and practice variables and the outcome measures are rather few and far between.

Personnel and Personnel Expenditures—The group of variables we have called Personnel and Personnel Expenditures manifests a greater frequency of association with the outcome measures. This association is independent of the students' social background and Size of the school, but not, as we shall see, of various racial-ethnic factors. One of the more prominent variables is the school's Specialized Staff and Services. It is negatively associated with Educational Plans and Desires and posi-

[7] Of course, this particular analysis does not single out particular subgroups of students for whom tracking may or may not play a decisive role.

tively with Achievement and with Percent of Graduates Going on to Postsecondary Vocational Training. The "specialized staff" of this index include all the specialized teachers that a school has—teachers of art, music, speech, and remedial reading, as well as guidance counselors, librarians, nurses, and the number of special classes offered. The partial correlations here suggest that a high score on Specialized Staff and Services tends to be characteristic of schools where the students do not have long-range educational plans. These same schools may produce more Achievement (perhaps through the influence of the specialized teachers), and may have more graduates who go on to postsecondary vocational work (perhaps through the influence of the guidance counselors).

Teaching Conditions is another salient variable in this set. It is positively associated with Student Body's Educational Plans and Desires, Achievement, and Percent Going on to College. It is negatively associated with Percent of Dropouts. This index indicates the teacher's view of his teaching situation. A teacher with a high score is telling us that he feels that the students put forth a lot of effort to achieve and are of high academic ability. He also feels that the school has a good reputation and that there is a relative absence of school problems, etc. A teacher with a low score feels that there are many problems with the students. The important point to note is that this is what the *teacher* feels; the associations observed with this index are independent of the social background of the students in his school. Consequently, the teacher's attitudes toward the students may influence certain school outcomes independently of the student's social background. This may be the case with Achievement and with Student Body's Educational Plans and Desires. Many of the same kinds of considerations apply to Teacher's Preference for Student-Ability Level. Moreover, the Teacher's College Attended is positively related to Achievement.[8]

Conspicuous by reason of their failure to enter into any relationship are such variables as Teacher's Localism, Teacher's Socio-Economic Background, and Teaching-Related Activities. The relationship of Teacher's Training to Percent of Nonwhite Going on to College baffles ready interpretation. One would anticipate that this index would be related to more than just this particular outcome.

The Teacher's Racial-Ethnic Group Membership, however, is positively related both to Achievement and to the Percent of Dropouts. This suggests that white as opposed to nonwhite teachers may both promote more Achievement in their students *and* promote more dropouts. Indeed, if Achievement were negatively related to Percent of Dropouts one might facetiously argue that the teachers produce more Achievement by encouraging the lower achieving students to drop out. The role of white teachers in producing achievement is a point to which we shall return.

[8] A teacher with a high score on this index went to a public or private university (as opposed to a junior college or teachers' college) that offered an advanced degree, and felt that the school at which he was teaching had a high academic standing.

Higher paid teachers are found in higher achieving schools independently of student body's social background and school Size. This may indicate something about the competence of the teachers, an inference supported by the fact that Teacher's Vocabulary Score, which should play a role in teaching proficiency, is also correlated with Achievement. The negative relationship of Vocabulary Score with Expectations suggests that lower scoring teachers may be producing higher expectations, which seems unrealistic of them.

The association of Percent of White Students at Teacher's Undergraduate Institution with Achievement sheds a little more light on the role of white teachers. If we can regard this association as being at least partly causal, then it suggests that the better preparation of white teachers is manifested in the higher achievement levels of their students. It should also be noted that there is a positive association of Percent White of Teachers' Students with Expectations and with Percent of Nonwhite Going on to College, and that this association is independent of the student body's social background and school Size. If it is causal, this association suggests that classroom integration may have a favorable influence. One would also assume that this influence would occur for some of the other measures unless it is bound up with the students' social background.

We may conclude, then, that the personnel and personnel expenditure variables play a greater role in the outcome measures than do the facility or policy variables.

Student Body Attributes.—The different outcome measures of the Student Body are the ones that have the greatest number of interrelationships. This indicates that a school with a high score on one outcome measure tends to score high on other outcome measures as well, and that this trend prevails independently of the students' social background and the school's Size. Some kind of a student body influence may be at work here, effecting a mutual reinforcement of certain goals. The nature of student body influences on subsets of students was partly investigated in the first report on the Educational Opportunities Survey (Coleman et al., 1966). More detailed investigations will be forthcoming in a later volume in this series.

The association of Proportion of Females in the Student Body is positive for Expectations, Attitude Toward Life, and Study Habits, but negative for Achievement. The negative sign here is puzzling. One would expect this variable to be related positively to many of the outcome measures, especially Achievement, because it is an often-confirmed fact that women tend to do better than men in academic endeavors.

Kindergarten Attendance and Nursery School Attendance both appear to play important roles in the outcome measures. Apparently Expectations, Attitude Toward Life, Study Habits, and Achievement are all higher where a large proportion of students have attended Kindergarten. The same is true of Nursery School Attendance in relation to Expectations, Attitude Toward Life, Educational Plans, and Study Habits. Frequency of Parents'

PTA Attendance tends to have the same effect on Attitude Toward Life and Study Habits. The negative sign for English spoken at home (rather than some other language) is not easy to interpret.

SUMMARY

This chapter has attempted to study the relationship of a wide range of different variables to the outcome measures. Summaries were presented of a large number of partial correlations between these variables and the outcome measures. The correlations were independent of the social background of the student body [9] and the Size of the school. The groups of variables that were found to be most important for (or most frequently associated with) school outcomes were, in descending order: the attributes of the student body (viz, the kinds of students the school gets or has); the school personnel and personnel expenditures; the school's practices and policies; and the school's facilities.

[9] As defined by Student Body's Socio-Economic Status, Family Structure, and Racial-Ethnic Composition.

7. Stratified Regression and Commonality Analyses of School Attributes With Achievement

7.1. SELECTION OF VARIABLES FOR STRATIFICATION

The previous chapters showed how the school variables, both individually and in different combinations, related to school outcomes, including achievement. One result in this area was that the set of Student Body variables—Socio-Economic Status, Family Structure, and Racial-Ethnic Composition—played a greater independent role in many of the School Outcomes than did a comprehensive set of School variables.[1]

Earlier analyses of the dependence of school outcomes on students' social background showed that when there was a lower correlation of Achievement with Socio-Economic Status, using the school as unit of analysis, the relative roles of the student body and school variables were reversed.[2] This suggested that Socio-Economic Status of the Student Body related differentially to Achievement for different subgroups. We, therefore, selected Socio-Economic Status as one variable for stratifying schools in order to examine the relationship of school variables with Achievement. To keep down the sheer volume of analysis, only Achievement was focused on.

Another variable that was deemed to be of interest was the number of students enrolled in the school (School Size). Since this variable was a necessary correlate of the magnitude of a school's expenditures, it was hypothesized that there might be a point at which School Size and expenditures would be optimally related to Achievement. This line of reasoning was reinforced by the analyses in chapters 5 and 6 which, it will be recalled, showed a negligible relationship between School Size and School Outcomes. This suggested that there might be some underlying nonlinear relationship between the two that was being masked in an analysis that combined all the schools together. Accordingly, School Size was chosen as the second stratifying variable.

7.2. AN HYPOTHESIS-TESTING FRAMEWORK FOR STRATIFIED REGRESSIONS

The main topic of interest in these analyses was the extent to which the regression of Achievement on one or more sets of variables for each of the groups defined by the stratifying variables was different from the regression obtained for all of the schools combined. In order to answer this question we used an hypothesis-testing framework outlined by Kuh and programed by Beaton (Beaton, 1964). This is a sequential procedure which utilizes various sums of squares and mean squares from a covariance analysis. The sequence of hypotheses runs as follows:

H_1: Are the cell regressions (including the cell intercepts) similar to the overall regression obtained when all schools are combined? If they are, then the sequence is terminated. However, if this hypothesis is rejected, then the next hypothesis in the sequence is tested.

H_2: Are the cell slopes (excluding the cell intercepts) similar to the overall slope obtained when all schools are combined? If this hypothesis is rejected, then the sequence is terminated. However, if the hypothesis is accepted then (in Kuh's presentation) there are two more steps for distinguishing between different kinds of intercepts.[3]

The F statistic was used to determine whether to accept or reject the hypotheses. The following four-cell stratification was used:

		SOCIO-ECONOMIC STATUS: High	SOCIO-ECONOMIC STATUS: Low	
SIZE	Large			Total Large
	Small			Total Small
		Total High SES	Total Low SES	*All Schools Combined*

This hypothesis-testing framework does not allow for a direct test of the interaction between Size and Socio-Economic Status. Consequently, marginal analyses for these two variables are also given as an aid in inferring what the magnitude of their interaction might be. In order to conserve degrees of freedom two levels for each variable were used.

The analyses that follow use the student body and school variables as outlined in section 5.1 of chapter 5. For the two-set case the Student Body Background variables were used in conjunction with the comprehensive set of 31 School variables. For the four-set case the set of School variables was broken up into the three subsets of School Personnel and Personnel Expenditures, Pupil Programs and Policies, and Plant and Physical Facilities. For both the two-set and four-set case the Student Body Background variables remained the same: viz, Student Body's Socio-Economic Status, Family Structure, and Racial-Ethnic composition. It is important to note that the stratifying variables of Size and Socio-Economic Status were also retained in the analyses *within* each

[1] See chapter 5. The terms "independent" and "common role" are defined on page 52.

[2] See Mayeske et al., Technical Note 61, in the List of References (p. 115).

[3] Since only the first 2 hypotheses are of interest to our analysis the others will not be discussed.

stratum. The reason was that we anticipated there would be variations in Achievement within each cell or stratum that would be associated with these variables.

For almost all stratifications the F statistic for the 31 School variables and Student Body Background variables indicated that the cell slopes were different. These F values usually had a value of two or greater; the traditional significance levels were far surpassed.

As in other chapters, associational language will be used to summarize the results. Possible causal inferences will be reserved for the Summary.

7.3. COMMONALITY ANALYSES OF THREE STRATIFYING VARIABLES: THE TWO-SET CASE

The following tables give the squared multiple correlations, unique portions, and commonality coefficients for stratifications by Size (number of students enrolled in the school), Socio-Economic Status, and Size by Socio-Economic Status. The set of School variables is made up of the 31 variables outlined in chapter 5. The set of Student Body variables is made up of Student Body Socio-Economic Status, Family Structure, and Racial-Ethnic Composition.[4]

[4] A definition of commonality coefficients and unique associations for the 2-set case is given in chapter 5. See appendix II for a mathematical exposition.

7.3.1. Stratifications by Size

Table 7.3.1 gives the squared multiple correlations, commonality coefficients and unique portions for two levels of stratification by School Size. To define the two strata, the School Size distribution was cut at the approximate mean of the distribution for each grade level.

Inspection of table 7.3.1 shows that the unique portion for the Student Body variables, $U(B)$, is usually greater than the unique portion for the School variables, $U(S)$, except for large schools at the third and first grade. The commonality coefficient, $C(BS)$, remains high at each grade level for all stratifications. For large schools, however, it is usually a little higher. Moreover, Achievement is usually more predictable with the Student Body variables than with the School variables (see R^2 for a single set of variables). The exception to this is again at the first and third grades. In both places, Achievement is slightly more predictable for large schools with the School rather than the Student Body variables. When both the Student Body and School variables are used, Achievement is more predictable for large than for small schools at all grade levels (see R^2 for both sets of variables).

These results taken together suggest that when schools are stratified only by size there are no appreciable differences in the predictability of Achievement. The differ-

Table 7.3.1.—Squared Multiple Correlations [1] of B and S With Achievement, Expressed as a Function of Their Unique Association and Their Commonality Coefficients, for Stratifications by Size of School

Grade level	Commonality coefficients [2]	Sets of regressor variables					
		B	B	B	S	S	S
		Small	Large	All schools combined	Small	Large	All schools combined
12th	First order:						
	U(B)	07	04	08			
	U(S)				06	03	04
	Second order: C(BS)	73	86	75	73	86	75
	R^2 for a single set of variables	80	90	82	80	90	79
	R^2 for both sets of variables (B and S)	87	94	86	87	94	86
	Number of schools	513	267	780	513	267	780
9th	First order:						
	U(B)	09	10	11			
	U(S)				07	03	04
	Second order: C(BS)	69	81	73	69	81	73
	R^2 for a single set of variables	78	91	84	77	84	77
	R^2 for both sets of variables (B and S)	86	94	88	86	94	88
	Number of schools	265	335	600	265	335	600
6th	First order:						
	U(B)	11	08	10			
	U(S)				06	03	04
	Second order: C(BS)	64	75	69	64	75	69
	R^2 for a single set of variables	75	83	79	69	78	73
	R^2 for both sets of variables (B and S)	80	86	83	80	86	83
	Number of schools	1,070	1,302	2,373	1,070	1,302	2,372
3d	First order:						
	U(B)	11	02	07			
	U(S)				05	07	04
	Second order: C(BS)	36	56	45	36	56	45
	R^2 for a single set of variables	47	59	53	40	63	49
	R^2 for both sets of variables (B and S)	51	65	56	51	65	56
	Number of schools	1,151	1,302	2,453	1,151	1,302	2,453
1st	First order:						
	U(B)	10	09	05			
	U(S)				08	24	09
	Second order: C(BS)	31	37	38	31	37	38
	R^2 for a single set of variables	41	47	43	39	62	47
	R^2 for both sets of variables (B and S)	50	71	52	50	71	52
	Number of schools	614	688	1,302	614	688	1,302

[1] Rounded to 2 places of decimals after computation, leading decimal points omitted.

[2] Small schools have 789 or fewer students at grade 12, 631 or fewer at grade 9, and 418 or fewer at grades 6, 3, and 1.

ences that do appear are primarily at the lower grade levels. The most clearly defined trend is for Achievement to be more predictable for large than for small schools.

7.3.2. Stratification by Student Body Socio-Economic Status

Given a moderate-to-high correlation of the student body's Socio-Economic Status (SES) and Achievement, one would expect that if schools were stratified by SES, then its correlation with Achievement *within* each stratum would be considerably reduced. This would occur because the schools in each stratum tend to resemble each other in SES. Since within each stratum SES has a lower correlation with Achievement, there is a possibility that other variables might now correlate more highly with Achievement than they did for all schools prior to stratification. Table 7.3.2 presents the squared multiple correlations, unique portions, and commonality coefficients for two levels of stratification by SES. The SES distribution was cut at about its mean in order to define the two strata. The most obvious feature of table 7.3.2 is that the squared multiple correlations for the Student Body variables in each stratum show a moderate-to-marked decrease from the All Schools Combined value. In the light of our previous analysis, this was only to be expected. Clearly, the stratifications are at least partially effective in reducing the associations with SES.

Inspection of table 7.3.2 also shows that the unique portions for low SES schools are greater for the School variables (S) than for the Student Body variables (B), while for high SES schools the reverse is true. That is, for high SES schools the Student Body variables (B) have a greater unique portion than do the School variables (S), except at the first grade. Nothing in the earlier portion of our analysis had led us to expect these results.

The commonality coefficients, $C(BS)$, are uniformly larger for low SES than for high SES schools. This indicates that there is a greater overlap or confounding of Student Body and School variables for low SES than for high SES schools. Achievement is also more predictable from the School variables than from the Student Body variables for low SES schools. For high SES schools the reverse is true. In other words, for high SES schools Achievement is more predictable from the Student Body than from the School variables except at the first grade.[5] When both sets of variables are used, Achievement is more predictable for low SES than for high SES schools.[6] These results suggest that the role the school plays in promoting Achievement may differ according to the students' Socio-Economic Background. In fact, the lower the

[5] See R^2 for single sets of variables.
[6] Except at the 3d grade.

Table 7.3.2.—Squared Multiple Correlations [1] of B and S With Achievement, Expressed as a Function of Their Unique Association and Their Commonality Coefficients, for Stratifications by Student Body SES

Grade level	Commonality coefficients	Sets of regressor variables					
		B	B	B	S	S	S
		Low	High	All schools combined	Low	High	All schools combined
12th	First order:						
	U(B)	06	26	08			
	U(S)				15	19	04
	Second order: C(BS)	67	33	75	67	33	75
	R^2 for a single set of variables	73	59	82	82	52	79
	R^2 for both sets of variables (B and S)	88	78	86	88	78	86
	Number of schools	371	409	780	371	409	780
9th	First order:						
	U(B)	08	20	11			
	U(S)				15	13	04
	Second order: C(BS)	56	40	73	56	40	73
	R^2 for a single set of variables	65	59	84	71	53	77
	R^2 for both sets of variables (B and S)	79	72	88	79	72	88
	Number of schools	283	317	600	283	317	600
6th	First order:						
	U(B)	08	17	10			
	U(S)				09	09	04
	Second order: C(BS)	57	33	69	57	33	69
	R^2 for a single set of variables	65	50	79	66	42	73
	R^2 for both sets of variables (B and S)	74	59	83	74	59	83
	Number of schools	1,285	1,087	2,372	1,285	1,087	2,372
3d	First order:						
	U(B)	05	12	07			
	U(S)				07	09	04
	Second order: C(BS)	23	17	45	23	17	45
	R^2 for a single set of variables	28	29	53	29	26	49
	R^2 for both sets of variables (B and S)	35	38	56	35	38	56
	Number of schools	1,338	1,115	2,453	1,338	1,115	2,453
1st	First order:						
	U(B)	03	10	05			
	U(S)				16	12	09
	Second order: C(BS)	17	12	38	17	12	38
	R^2 for a single set of variables	20	22	43	33	24	47
	R^2 for both sets of variables (B and S)	36	34	52	36	34	52
	Number of schools	696	606	1,302	696	606	1,302

[1] Rounded to 2 places of decimals after computation, leading decimal points and zeroes omitted.

school's SES, the greater is the independent as well as the cooperative role of school attributes with student body attributes. Nevertheless, all low SES schools, unlike all high SES schools, do not have similar Achievement levels. The difference between the two types of schools here would appear to be in the relative roles of the Student Body and School variables in their relationship with Achievement levels.

7.3.3. Stratifications by School Size and Student Body Socio-Economic Status

Table 7.3.3 presents the squared multiple correlations, commonality coefficients and unique portions for stratifications by two levels of school Size and two levels of SES. These two levels were defined by cutting each distribution at about its mean.

Inspection of table 7.3.3 shows that the squared multiple correlations of the Student Body variables for the individual groups tend to be uniformly lower than for all groups combined. This is to be expected, since the schools within each cell are more homogeneous with regard to SES than they are between cells. Moreover, one of the Student Body variables is the Socio-Economic Status of the student body. One would expect, therefore, that the Student Body variables would play a lesser role than the School variables in predicting Achievement. But one would not expect the large differences in the level of predictability that are observed for some of these groups.

Inspection of the unique portions shows that the Student Body variables (B) have a smaller unique portion in predicting Achievement than do the School variables (S).[7] Some of these unique values for the individual strata are considerably larger than for all groups combined.

The commonality coefficients, $C(BS)$, increase in magnitude with the grade levels. For small schools, however, the commonality with high SES students is much lower than for the other groups. This indicates that there may be less of a common role played by these variables in their relationship with Achievement. For all the strata and grade levels,[7] the predictability of Achievement is greater from the School variables than from the Student Body variables. It tends to be smaller in absolute value for schools that are small in size and high in SES than for the other stratification groups. Except at grades three and one, this is true even when both S and B are used.

These results suggest that where schools are homogeneous in the socioeconomic backgrounds of their students

[7] Except at grades 6 and 9 for schools that are large in size and high in SES.

Table 7.3.3.—Squared Multiple Correlations [1] of B and S With Achievement, Expressed as a Function of Their Unique Association and Their Commonality Coefficients, for Stratifications by School Size and Student Body SES

Grade level	Commonality coefficients [2]	Sets of regressor variables									
		B	B	B	B	B	S	S	S	S	S
		Small low	Large low	Small high	Large high	All schools combined	Small low	Large low	Small high	Large high	All schools combined
12th	First order:										
	U(B)	05	08	21	03	08					
	U(S)						21	14	30	12	04
	Second order: C(BS)	66	71	33	76	75	66	71	33	76	75
	R^2 for a single set of variables	70	79	54	79	82	87	85	63	88	79
	R^2 for both sets of variables (B and S)	92	93	84	91	86	92	93	84	91	86
	Number of schools	278	93	235	174	780	278	93	235	174	780
9th	First order:										
	U(B)	05	12	08	20	11					
	U(S)						21	17	27	08	04
	Second order: C(BS)	57	56	31	58	73	57	56	31	58	73
	R^2 for a single set of variables	62	68	39	78	84	78	73	58	65	77
	R^2 for both sets of variables (B and S)	84	85	66	85	88	84	85	66	85	88
	Number of schools	143	140	122	195	600	143	140	122	195	600
6th	First order:										
	U(B)	07	10	13	18	10					
	U(S)						11	11	15	08	04
	Second order C(BS)	55	58	27	41	69	55	58	27	41	69
	R^2 for a single set of variables	62	68	40	59	79	66	68	42	49	73
	R^2 for both sets of variables (B and S)	73	79	55	67	83	73	79	55	67	83
	Number of schools	607	678	463	624	2,372	607	678	463	624	2,372
3d	First order:										
	U(B)	06	02	12	08	07					
	U(S)						09	09	12	14	04
	Second order: C(BS)	20	29	12	25	45	20	29	12	25	45
	R^2 for a single set of variables	26	32	24	33	53	29	38	24	39	49
	R^2 for both sets of variables (B and S)	36	41	36	47	56	36	41	36	47	56
	Number of schools	637	701	514	601	2,453	637	701	514	601	2,453
1st	First order:										
	U(B)	05	11	15	07	05					
	U(S)						17	35	17	23	09
	Second order: C(BS)	13	15	10	14	38	13	15	09	14	38
	R^2 for a single set of variables	18	25	24	20	43	30	50	27	37	47
	R^2 for both sets of variables (B and S)	35	60	41	43	52	35	60	41	43	52
	Number of schools	326	370	288	318	1,302	326	370	288	318	1,302

[1] Rounded to 2 places of decimals after computation, leading decimals and zeroes omitted.
[2] Small schools have 789 or fewer students at grade 12, 631 or fewer at grade 9, and 418 or fewer for grades 6, 3, and 1.

the school variables may play a greater role in promoting Achievement than where they are heterogeneous. The extent of this involvement seems likely to vary with the level of socioeconomic background of the students and the number of students in the school.

7.4. COMMONALITY ANALYSES OF THREE STRATIFYING VARIABLES: THE FOUR-SET CASE

Commonality analyses have already been conducted for Student's Socio-Economic Status, Family Structure, and Racial-Ethnic Composition (i.e., the set we have called *B*), and for School Personnel and Personnel Expenditures, Pupil Programs and Policies, and Plant and Physical Facilities.[8] For the four-set case these analyses did not yield many new insights. Consequently, the extensive tabular material is not presented. For all the stratifications it was observed that most of the predictable variance in Achievement was contained in the second-order commonality for the Student Body and School Personnel variables. The Pupil Programs and Facilities sets tended to join with the Student Body and School Personnel sets at the third order. These are the same kinds of trends that were observed in chapter 5.

The predictability of Achievement for the different strata using the School Personnel variables was much the same as for the two-set case. That is, Achievement was more predictable from the set of School Personnel variables for Large than for Small schools, for Low than for High SES schools, and for both Small and Large Low SES schools than for Small and Large High SES schools.

SUMMARY

This chapter attempted to study the manner in which different sets of variables contributed to Achievement when schools were stratified into two levels of School Size and two levels of Student Body's Socio-Economic Status. Analyses were conducted with both two sets and four sets of variables. For the two-set case a set of variables consisting of Student Body's Socio-Economic Status, Family Structure, and Racial-Ethnic Composition was used to represent the student body attributes, and a comprehensive set of 31 variables to represent the school attributes. For the four-set case the same set of variables was used to represent the student body attributes. The set of school variables, however, was subdivided into: School Personnel and Personnel Expenditures, Pupil Programs and Policies, and Plant and Facilities.

The most notable result obtained from the stratifications by School Size was that over the different grade levels Achievement tends to be more predictable for Large than for Small schools. The stratifications by Student Body's Socio-Economic Status (SES) showed that the independent role played by the Student Body variables was greater than that of the School variables for high SES schools. In contrast, for low SES schools the School variables played a greater independent role than the Student Body variables. There was also more confounding or overlap between the Student Body and School variables for low than for high SES schools.

Achievement was found to be more predictable for low SES than for high SES schools. As fas as its contribution to Achievement was concerned, the School Personnel set of variables for the four-set case was found to parallel the set of School variables for the two-set case.

When stratifications were made by both Size and SES, Small schools with high SES students were found to differ most from schools in other categories. For these schools, Achievement was found to be less predictable, the overlap or confounding of the Student Body and School variables was lower, and the School variables played a larger independent role in Achievement. For the four-set analysis, the set of variables pertaining to the School Personnel was found to parallel the results obtained for the School variables in the two-set case.

In general, these results suggest that the extent of involvement of School variables and Student Body variables in the prediction of Achievement will vary with School Size, on the one hand, and Student Body's Socio-Economic Status, on the other. But before any conclusions can be reached about the efficacy of these stratifications other kinds of stratifications need to be tried.

[8] Both the variables and the analyses in question are described in chapter 5.

8. A Quasi-Longitudinal Study of School Achievement

8.1. COMPARISONS BETWEEN GRADES

In the foregoing chapters a frequently used dependent variable has been achievement at a given grade level. Such a measure reflects the students' lifetime experiences. In focusing on the formal educational process, however, it is also desirable to examine changes that take place during the school years. This can be done by controlling on the initial standing of the schools, that is, by statistically equalizing the starting point in first grade. The effect is to put school factors on a more equal footing with student background factors as determinants of achievement. As we have already explained (pp. 4–7), this is not the kind of problem the Educational Opportunity Survey was designed to solve. Due to the survey's cluster sampling technique, it was possible to carry out quasi-longitudinal analyses of achievement. This chapter is devoted to such analyses.

Two analyses were undertaken, one at the third-grade level and one at the sixth grade. Since the approach was the same, it will be sufficient to describe only the third-grade analysis.

The study was naturally restricted to schools for which both first- and third-grade data were available. In the absence of longitudinal data, it was assumed that if the third graders in a given school had been tested 2 years earlier, their average score would have been the same as the average of the first graders in that school who actually were tested. This is a plausible assumption if the determinants of first-grade achievement were in fact the same for these two groups of students. We therefore need a single overall measure that allows us to compare both of them. The comparison should be on the basis of how similarly they would respond to a first-grade achievement test. We therefore need to define the weighted sum of student body variables that is more highly correlated with first-grade achievement. These weights were found to be 0.360 for Socio-Economic Status, 0.004 for Family Structure and Stability, and 0.431 for Racial-Ethnic Group Composition. Thus, for each school we have the weighted first-grade sum:

$$S_1 = 0.360\, X_{1\ SES} + 0.004\, X_{1\ FSS} + 0.431\, X_{1\ RACE}$$

where

$X_{1\ SES}$ is the school average on the first-grade Socio-Economic Status index;

$X_{1\ FSS}$ is the school average on the first-grade Family Structure and Stability index;

$X_{1\ RACE}$ is the school average on the first-grade Racial-Ethnic Group index.

Likewise for each school the weighted third-grade sum is:

$$S_3 = 0.360\, X_{3\ SES} + 0.004\, X_{3\ FSS} + 0.431\, X_{3\ RACE}$$

The similarity between the first and third grades is then indicated by the correlation between S_1 and S_3. In the present case, this was found to be 0.89. At the sixth grade a similar weighted sum S_6 was defined and the correlation between S_1 and S_6 found to be 0.86. These high correlations suggest that for our purposes the student bodies are indeed similar. We may therefore assume that the findings of our quasi-longitudinal analysis are truly indicative of changes that occur during the school experience.

The next point of interest is how strong a relationship exists between first- and third-grade achievement. If these variables are highly correlated, then most of the variation in third-grade achievement can be accounted for by first-grade achievement. In such a case there would be little residual variation to be accounted for by student background and school variables. The correlation, however, is 0.69. This implies that 52 percent of the variation in third-grade achievement is unexplained by first-grade variation. At the sixth grade the corresponding figure is 54 percent.[1] To be sure, some of the unexplained variation may arise because the student bodies are not exactly the same. Nevertheless, these values seem to justify the next step, which is to regress the residual variation in achievement against potential determinants of achievement.

On the basis of the foregoing reasoning the third-grade scores were, in effect, regressed against first-grade scores. The resulting residuals, which are uncorrelated with first-grade scores, were then regressed against the student body background variables and the school variables.[2] The first-grade tests were administered at the beginning of the school year. Our procedure therefore controls for the initial achievement of the students without removing from the background and school variables the variance they share with the first-grade scores.[3]

Another way of looking at the analysis is as follows. The zero-order correlations between third-grade achievement and the student body background and school vari-

[1] These correlations assume a linear relationship. A log-log transformation of the 1st- and 6th-grade data left 62 percent of the variation unexplained.

[2] The fact that the residuals are uncorrelated with the 1st-grade scores is an important property. In other procedures—taking simple differences, for example, or ratios of achievement scores—this is not so, and the result is therefore a set of correlations between dependent and regressor variables that are systematically biased.

[3] For a more extensive discussion of this approach, see Thorndike, 1963.

ables are replaced by part correlations. First-grade achievement is partialed out of third-grade achievement. A part correlation is defined as

$$r_{i(j.k)} = \frac{r_{ij} - r_{ik}\, r_{jk}}{\sqrt{1 - r^2_{jk}}}$$

where

the i subscript corresponds to a student body background or school variable;

the j subscript corresponds to a third-grade achievement;

the k subscript corresponds to first-grade achievement.[4]

Comparison with the corresponding partial correlation shows that the part correlation

$$r_{ij.k} = \frac{r_{ij} - r_{ik}\, r_{jk}}{\sqrt{1 - r^2_{ik}}\sqrt{1 - r^2_{jk}}}$$

is of the same sign as the partial correlation, but that the absolute value is smaller. By computing part correlations and substituting them for the corresponding zero-order correlations, the quasi-longitudinal regression analyses were performed directly on the modified correlation matrices. This procedure avoided dealing directly with the residuals.

Regression and commonality analyses with respect to residual achievement used the same student and school variables as were set forth in chapter 5. Stratified regressions of the type described in chapter 7 were also carried out, but their results were so close to those obtained earlier that they will not be given here.

8.2. PART CORRELATIONS WITH ACHIEVEMENT

Before looking at the regression analyses it will be useful to examine the part correlations of the highest correlates with achievement. We will look only at third-grade variables for which the absolute value of the zero-order correlation with achievement is equal to or greater than 0.15, and at sixth-grade variables for which it is equal to or greater than 0.20. These variables are displayed graphically in figure 8.2.1. The vertical scale runs from a correlation of 0.05 to one of 1.0. Four correlations are shown for each variable: the left-most for the third-grade, zero-order correlation with achievement; followed by the third-grade part correlation; the sixth-grade part correlation; and the sixth-grade, zero-order correlation. Two of the variables, Free Milk and Lunch Programs, and Teaching-Related Activities, actually have negative correlations. But, since our interest here is in changes, the absolute values of these variables have been plotted.

If we confine our examination to variables that appear at both grade levels, we are led to conclude that they tend to fall into two groups:

(1) Those with relatively high zero-order correlations: viz, Student Body's Socio-Economic Status, Student Body's Racial-Ethnic Composition, Teacher's Racial-Ethnic Group Membership, Teaching Conditions Teacher's Vocabulary Score, and Student Body's Family Structure and Stability.

(2) Those with relatively small correlations: viz, Teacher's Preference for *High-Ability Students*, Principal's Estimate of School Reputation, Teacher's Socio-Economic Background, Specialized Staff and Service, Teacher's College Attended, and Accreditation of School.

In each case the part correlation is less than the zero-order correlation. The net effect, however, is to bring the two groups closer together. As a result, the role of the weaker variables is strengthened. This result is most noteworthy at the third grade; by the sixth grade the old groups are beginning to reform. The strength of some variables changes between the third and sixth grades. For instance, there are decreases in both Teaching Conditions and Principal's Estimate of School Reputation, and increases in Teacher's College Attended.

Analysis revealed that the part correlations were smaller, with a few very minor exceptions, than the zero-order correlations. We may infer, then, that first-grade achievement was not masking any important relationships between higher grade achievement and the other 34 variables.

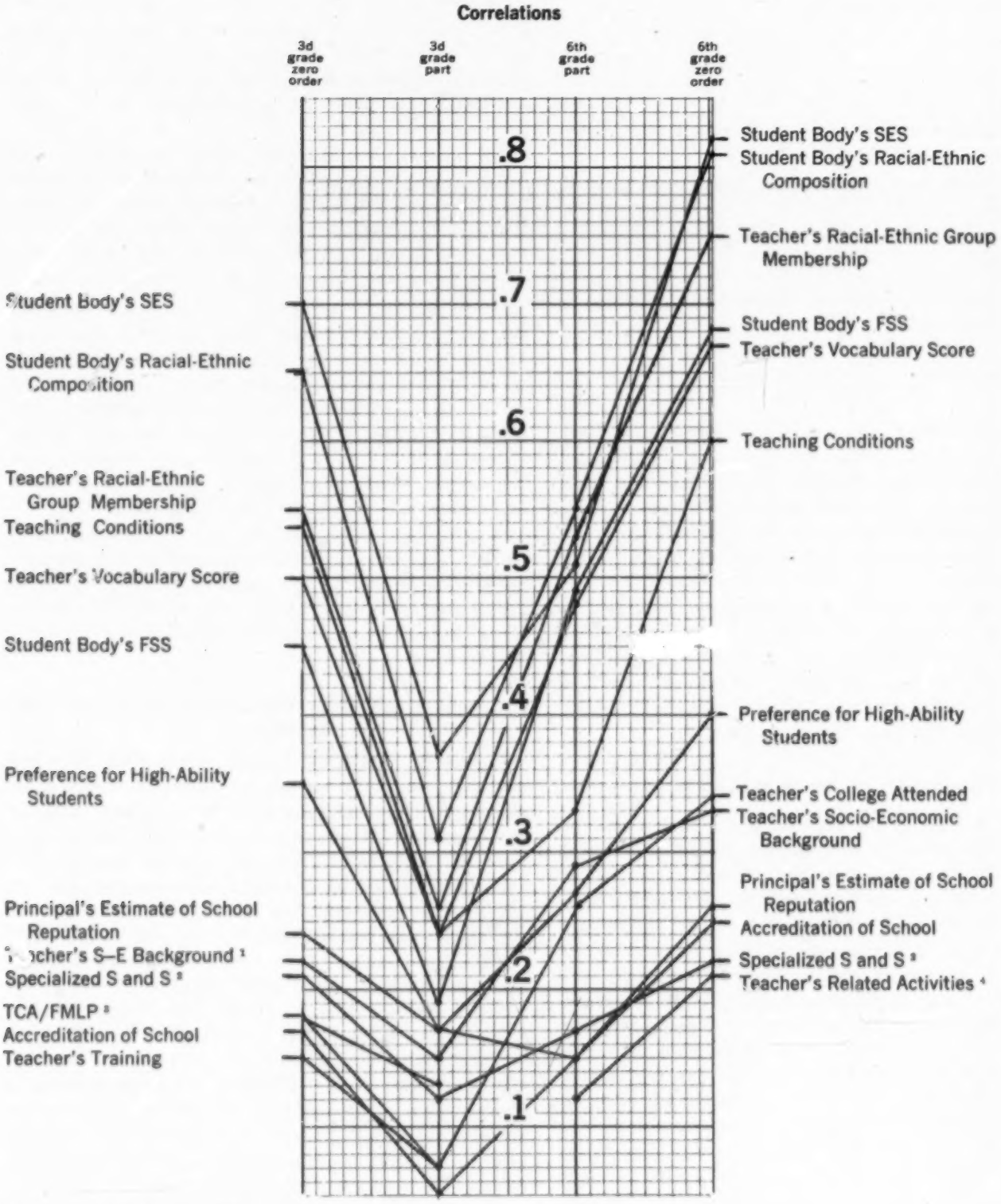
8.3. REGRESSION AND COMMONALITY ANALYSES FOR TWO SETS OF VARIABLES

Regression analyses of residual achievement were carried out using the subsets of variables described in chapter 5. The results are given in table 8.3.1. Residual achievement is of course less predictable than absolute level of achievement. But the general pattern that emerges from the commonality analysis is similar to the one already discovered. The squared multiple correlation for third-grade achievement was 0.5646, compared to 0.1758 for residual third-grade achievement; sixth-grade achievement was 0.8296, compared to 0.4111 for residual sixth-grade achievement. The unique associations of both student body and school variables are still small and are in any case overshadowed by the commonality coefficient $C(BS)$. However, the large decrease in predictability associated with the control on first-grade achievement results largely from the smaller commonality coefficients. In consequence, the unique associations account for a larger portion of the explained variation. As before, the commonality coefficient for student body and school variables is larger at the higher grade level.[5]

[4] See DuBois, 1957; McNemar, 1962.

[5] This is probably due to the greater predictability at the 6th grade rather than to more highly interrelated regressor variables.

Figure 8.2.1.—Zero-Order and Part Correlations With Achievement



[1] Teacher's Socio-Economic Background.
[2] Specialized Staff and Services.
[3] Teacher's College Attended/Free Milk and Lunch Programs.
[4] Negative Correlations.

Table 8.3.1.—Comparison of 3d- and 6th-Grade Achievement Regression Analyses[1] With Residual Achievement Regression Analyses for Student Body and School Variables

Commonality coefficients[2]	Student body (B)				School (S)			
	3d-grade achievement	Residual 3d-grade achievement	Residual 6th-grade achievement	6th-grade achievement	3d-grade achievement	Residual 3d-grade achievement	Residual 6th-grade achievement	6th-grade achievement
First U(B)	07	04	05	10				
Order U(S)					04	03	06	04
Second order C(BS)	45	11	30	69	45	11	30	69
R^2 for a single set of variables	53	15	35	79	49	13	36	73
Number of schools	2,453	1,105	1,014	2,372	2,453	1,105	1,014	2,372

[1] Rounded to 2 places of decimals after computation, leading decimal points and zeros omitted.

[2] The squared multiple correlations obtained when both sets are entered into the regression are: 3d grade, 56; residual 3d, 18; 6th grade, 83; residual 6th grade, 41.

8.4. REGRESSION AND COMMONALITY ANALYSES FOR FOUR SETS OF VARIABLES

Table 8.4.1 displays the results of residual achievement regressed on four sets of variables: Student Body, School Personnel and Personnel Expenditures, Pupil Programs and Policies, and Physical Plant and Facilities. As may be seen by looking at the next-to-last row of the table, residual sixth-grade achievement is equally predictable from Student Body or School Personnel variables. At the third-grade level Student Body variables are slightly better predictors. From the same row it may be seen that residual achievement is virtually unrelated to Pupil Programs and Policies or to Physical Plant and Facilities.

Looking at the commonality analysis we see that the unique associations of the Student Body variables are somewhat larger than those of the School Personnel variables. The predominant coefficient is still the commonality between the two sets. There is some evidence that removing the variation in first-grade achievement scores is less detrimental to the predictive capacity of School Personnel variables than to that of Student Background variables. At any rate, the decrease in R^2 for the sixth grade is larger for Student Background variables than for School Personnel, and the unique associations of the former do not hold up as well as those of the latter. The part correlations of regressor variables with achievement vis-a-vis the zero-order correlations also support this view.

SUMMARY

The purpose of this chapter was to examine the roles of student and school characteristics in the determination of scholastic achievement after equalizing the inputs to the schools. This equalization was on the basis of achievement tests administered at the beginning of the first grade. Since real longitudinal data were not available, the analysis depends upon the assumption that the determinants of first-grade achievement for first-, third-, and sixth-grade students in a given school were comparable. Evidence in support of this assumption was presented. Conceptually the procedure was to regress third-grade achievement against first-grade achievement, and then to use the residuals as a new dependent variable. The procedure was repeated for sixth-grade achievement.

A total of 34 student and school variables were then used to predict the residual scores, and thus to account for the variation among overachieving and underachieving schools. The three student variables were Socio-Economic Status, Family Structure and Stability, and Racial-Ethnic Group Composition. The 31 school variables were divided into 17 variables pertaining to school personnel and personnel expenditures, 10 variables pertaining to pupil programs and policies, and four variables pertaining to the school's physical plant and facilities.

The regression and commonality analyses yield a pattern from which three pairs of possible alternative conclusions can be drawn, as follows:

(1) Third-grade and sixth-grade achievement either are or are not highly predictable from first-grade achievement;

(2) Factors attributable to the students either do or do not exert a continuing influence upon achievement during the elementary school years;

(3) Factors associated with the schools either do or do not affect scholastic achievement.

The first noteworthy result was that the degree of relationship between first-grade achievement and higher-grade achievement was rather moderate: first-grade achievement accounted for only 48 percent of the third-grade variation and 46 percent of the sixth-grade variation. Though some of the residual variation might have been attributable to differences between the student bodies, there was a definite possibility that a substantial portion of the variation in scholastic achievement could be explained by factors operating during the school years, not the preschool years.

Further analysis showed that the 34 student and school variables were not very good predictors of residual third-grade achievement. However, the explained variance, though small, was partitioned among several sets of variables to much the same effect as in earlier analyses. That is, the largest unique contributions were made by the Student Body and School Personnel sets of variables, and the joint contribution of these two sets was larger than that of either alone. Negligible contributions were made by Pupil Programs and Policies and by Plant and Facilities.

At the sixth-grade level residual achievement was more predictable. The relative contributions of the various sets of variables, as revealed by commonality analysis, were similar to those of nonresidual analysis. There was some evidence, however, that school variables might be somewhat more prominent than before.

Table 8.4.1.—Comparison of 3d- and 6th-Grade Achievement Regression Analyses [1] With Residual Regression Analyses for Student Body Variables and Three Sets of School Variables

Commonality coefficients [2]	Sets of regressor variables															
	Student body (B)				School personnel and personnel expenditures (T)				Pupil programs and policies (P)				Physical plant and facilities (F)			
	3d-grade achievement	Residual 3d-grade achievement	Residual 6th-grade achievement	6th-grade achievement	3d-grade achievement	Residual 3d-grade achievement	Residual 6th-grade achievement	6th-grade achievement	3d-grade achievement	Residual 3d-grade achievement	Residual 6th-grade achievement	6th-grade achievement	3d-grade achievement	Residual 3d-grade achievement	Residual 6th-grade achievement	6th-grade achievement
First order: U(Xi)	07	04	05	10	03	02	03	03	----	01	02	01	----	----	----	----
Second order:																
C(BT)	35	08	27	55	35	08	27	55	----	----	----	----	----	----	----	----
C(BP)	01	----	−01	----	----	----	----	----	−01	----	−01	----	----	----	----	----
C(BF)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
C(TP)	----	----	----	----	----	----	01	01	----	----	01	01	----	----	----	----
C(TF)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
C(PF)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Third order:																
C(BTP)	08	01	03	12	08	01	03	12	08	01	03	12	----	----	----	----
C(BTF)	02	01	01	02	02	01	01	02	----	----	----	----	02	01	01	02
C(BPF)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
C(TPF)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Fourth order: C(BTPF)	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
R^2 for a single set of variables	53	15	35	79	48	12	35	72	10	02	06	14	02	02	----	02
Number of schools	2,453	1,105	1,014	2,372	2,453	1,105	1,014	2,372	2,453	1,105	1,014	2,372	2,453	1,105	1,014	2,372

[1] Rounded to 2 places of decimals after computation, leading decimal points and zeros omitted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression are: 3d grade, 56; residual 3d grade, 18; 6th grade, 83; residual 6th grade, 41.

On the basis of our quasi-longitudinal analysis we suggest the following paradigm. Suppose the Nation's elementary schools were to be endowed with a student population that was homogeneous in initial academic ability but distributed among schools differing in quality of personnel, community environment, and so on. Within 2 or 3 years, achievement tests would show differences among the schools. But there would also be much doubt about what factors caused the differences. Finally, after about 5 years, the patterns would become much clearer. We would conclude that student background factors, together with certain school factors, can be influential in the determination of scholastic achievement. However, we would also note that the school personnel factors which correlate positively with achievement tend to be found in association with student home backgrounds that are conducive to high achievement. The relative importance of the two types of factors cannot be determined from a random sample of schools.

9. The Role of Multiple School Outcomes

Chapter 4 showed that the School Outcome measures were substantially correlated with one another. Chapter 5 suggested that the influence of the schools on the Outcome measures was bound up with the kinds of students they receive initially. Chapter 6 showed that many of the Outcome measures were substantially correlated with one another even after associations attributable to School Size and Student Body Social Background had been removed through partial correlation techniques.

These results show that schools with a favorable performance on one school outcome tend to have a favorable performance on other school outcomes as well. It is hypothesized that these favorable performances facilitate one another over time. The interrelationships that exist among the outcomes are therefore the result of several years' association. They also result, of course, from interrelationships that were present among the outcomes at some earlier point in time. This chapter attempts to determine the role of multiple School Outcomes in the light of these considerations.

9.1. SELECTION OF THE VARIABLES

The 31 variable set designated School variables, as well as the set of Student Body Social Background variables, have the same composition in this chapter as in chapter 5 (pp. 41–42). The composition of the third set of variables used in these analyses—a set we called O_i—varies with the dependent variable. For the third, sixth, ninth, and 12th grades the following O sets were used with the following dependent variables: [1]

Dependent variable	O_i
Achievement	Expectations Attitude Toward Life Educational Plans Study Habits
Study Habits	Expectations Attitude Toward Life Educational Plans Achievement
Educational Plans	Expectations Attitude Toward Life Study Habits Achievement
Attitude Toward Life	Expectations Educational Plans Study Habits Achievement
Expectations	Attitude Toward Life Educational Plans Study Habits Achievement

[1] For definitions of these variables see pp. 12-15.

These sets are called the O_i sets since for each of the dependent variables the O set includes the four other outcome measures.

At the 12th grade we conducted analyses using five additional outcome measures: Percent of Graduates Going to College (both Total and Nonwhite), Percent of Graduates Going on to Postsecondary Vocational Training (both Total and Nonwhite), and Percent of Boy Dropouts. For these latter variables two special analyses were run. The first special analysis used as an O set the following set of five outcome measures (O_5):

Dependent variable	O_5
Percent Total and Nonwhite to College. Percent Total and Nonwhite to Postsecondary Vocational Training. Percent of Boy Dropouts.	Expectations Attitude Toward Life Educational Plans Study Habits Achievement

The O_5 set is the same for each dependent variable; it is therefore called a fixed set.

The second special analysis used the nine other outcome measures at the 12th grade for each dependent variable. They are therefore designated the O_9 sets. Two examples follow:

Dependent variable	O_9
Percent to College	Percent Nonwhite to College Percent to Postsecondary Training Percent Nonwhite to Postsecondary Training Percent Boy Dropouts Expectations Attitude Toward Life Educational Plans Study Habits Achievement
Expectations	Percent to College Percent Nonwhite to College Percent to Postsecondary Training Percent Nonwhite to Postsecondary Training Percent Boy Dropouts Attitude Toward Life Educational Plans Study Habits Achievement

There are 10 of these sets, one for each of the dependent variables at the 12th grade. The following section develops commonalities for our three sets of variables.

9.2. DEVELOPMENT OF A MEASURE OF COMMONALITY FOR B, S, AND O

Let B denote the Student Body Background variables, S the set of School variables, and O the set of other Outcome measures. Then the first-order commonality coefficient, or portion of the squared multiple correlation that is uniquely associated with a given dependent variable, is given by:

$$U(B) = R^2(B,S,O) - R^2(S,O)$$

$$U(S) = R^2(B,S,O) - R^2(B,O)$$

$$U(O) = R^2(B,S,O) - R^2(B,S)$$

where

R^2 represents the squared multiple correlation for the particular set of variables in parentheses with the dependent variable.

The second-order commonality coefficients are given by:

$$C(BS) = R^2(B,S,O) - R^2(O) - U(B) - U(S)$$

$$C(BO) = R^2(B,S,O) - R^2(S) - U(B) - U(O)$$

$$C(SO) = R^2(B,S,O) - R^2(B) - U(S) - U(O)$$

The third-order commonality coefficient (there is only one) is given by:

$$C(BSO) = R^2(B,S,O) - R^2(B,S) - R^2(B,O) - R^2(S,O) - U(B) - U(S) - U(O)$$

The squared multiple correlation for any single set can then be expressed as a function of its commonality coefficients for each order. For example, $R^2(O)$, which is of course the squared multiple correlation for O, can be expressed as:

$$R^2(O) = C(BSO) + C(BO) + C(SO) + U(O)$$

The basic tabular form used for B, S, and O in these analyses is as follows:

Commonality coefficients	Sets of regressor variables		
	B	S	O
First order:			
U(B)	XX		
U(S)		XX	
U(O)			XX
Second order:			
C(BS)	XX	XX	
C(BO)	XX		XX
C(SO)		XX	XX
Third order: C(BSO)	XX	XX	XX
R^2 for a single set	R^2(B)	R^2(S)	R^2(O)

The X's in the first column represent the unique portions for B and the amount of predictable variance that is shared with the other sets of variables. The second-order commonality coefficients show the amount of predictable variance that is common to the two sets under consideration. The third-order commonality coefficient shows the amount of predictable variance that is common to all three sets. The unique portions and the commonality coefficient values in each column sum to the squared multiple correlation (R^2) for that set of variables. In the other columns, the values of the commonality coefficients will be the same for the two sets represented in the parentheses. For example, the row for $C(BS)$ will have the same entry in the B and in the S columns. The tables in the following section starting with table 9.3.3., give the commonalities for these three sets of variables.

9.3. REGRESSION AND COMMONALITY ANALYSES FOR B, S, AND O

Two main questions are addressed in this section: (1) To what extent can the predictable variance in each outcome measure, as indicated by the squared multiple correlation, be uniquely apportioned to one of the three sets of variables under consideration? (2) To what extent is this predictable variance shared in common by two or more sets of the variables?

Systematic changes in the commonalities at the different grade levels may indicate the extent to which the outcomes facilitate one another. For example, if the Outcomes do operate in a mutually reinforcing way then we would expect them to become more highly intercorrelated over time. Moreover, these higher intercorrelations would be accompanied by an increase in the portion of variance shared by the sets of variables, with a corresponding decrease in the unique portions.

Since many of the indices are sparsely represented at the third grade emphasis will not be given to the third-grade results unless they are in alignment with the other grade levels. The only outcome measure available at the first grade was Achievement. Consequently, these multiple outcome analyses were not conducted for the first grade. Commonality values of less than 0.01 will not be discussed. As with other chapters, associational language will be used throughout the main body of the chapter and possible causal inferences will be reserved for the Summary.

Before we proceed to the commonality analyses it is pertinent to ask what additional contribution to the prediction of the dependent variable is made by O after B and S have been entered into the regression. A small contribution would suggest that the other Outcomes enter into the prediction mainly through the higher order commonalities, and a large one that their main contribution is unique. The contribution may be calculated as

$$R^2(B, S, O) - R^2(B, S)$$

where

$R^2(B, S, O)$ is the squared multiple correlation when all three sets are entered into the regression

$R^2(B, S)$ is the squared multiple correlation when only B and S are entered into the regression

The squared multiple correlations and their differences are given in tables 9.3.1 and 9.3.2.[2] Table 9.3.1 gives the squared multiple correlations for B, S, and O at each

[2] The differences are the same as the unique values U (O) in the outline table.

Table 9.3.1.—Comparison of the Increase in the Squared Multiple Correlations [1] of B and S, When Including O

Grade level [2]	Dependent variable				
	Expectations	Attitude toward life	Educational plans	Study habits	Achievement
12th: [3]					
R^2 (B, S, O)	63	70	73	72	90
R^2 (B, S)	44	56	61	56	86
Difference	19	14	12	16	03
9th:					
R^2 (B, S, O)	80	79	78	87	88
R^2 (B, S)	63	64	67	78	87
Difference	17	15	11	09	02
6th:					
R^2 (B, S, O)	71	80	73	81	84
R^2 (B, S)	49	58	52	60	83
Difference	22	21	21	22	01
3d:					
R^2 (B, S, O)	47	41	39	61	57
R^2 (B, S)	26	27	21	53	56
Difference	20	14	17	07	01

[1] Rounded to 2 places of decimals after computation, leading decimal points omitted.
[2] The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.
[3] R^2 (*B, S, O*) is the squared multiple correlation for all 3 sets, R^2 (*B, S*) is the squared multiple correlation for the Student Body (*B*) and School (*S*) sets. The "*O*" set in each case includes the 4 other outcome measures. For example, when Expectations is the dependent variable the "*O*" set includes Attitude Toward Life, Educational Plans, Study Habits, and Achievement.

grade level. The *O* set in each case includes the four other outcome measures. For example, when Expectations is the dependent variable the *O* set includes the other outcome measures of Attitude Toward Life, Educational Plans, Study Habits and Achievement. These are the sets called "O_4 sets" in section 9.3.1. The row labeled "DIFFERENCE" for each grade level in this table shows the amount of variance in the dependent variable associated with the O_4 set after the amounts of variance associated with *B* and *S* have been accounted for.

Inspection of these values for the different dependent variables shows that there is a substantial increase in predictability associated with the O_4 sets. The values are very much less for Achievement than for the attitudinal and motivational variables of Expectations, Attitude Toward Life, Educational Plans, and Study Habits. They tend to diminish slightly at the higher grade levels for Expectations and Educational Plans, increase somewhat at the higher grade levels for Achievement, increase through grade six and then decrease for Attitude Toward Life, and oscillate from low to high and back for Study Habits.

Table 9.3.2.—Comparison of the Increase in the Squared Multiple Correlations [1] of B, S, and O, When Including the Special 12th-Grade Measures

Squared multiple correlations [2]	Dependent variable				
	Percent to college	Percent nonwhite to college	Percent to postsecondary	Percent nonwhite to postsecondary	Percent boy dropouts
R^2 (B, S, O_9)	67	44	33	44	36
R^2 (B, S, O_5)	65	28	29	27	35
Difference	03	16	04	18	01
	Dependent variable				
	Expectations	Attitude toward life	Educational plans	Study habits	Achievement
R^2 (B, S, O_9)	66	71	77	73	90
R^2 (B, S, O_4)	63	70	73	72	90
Difference	03	00	04	01	00

[1] Rounded to 2 places of decimals after computation, leading decimal points omitted.
[2] *R* (*B, S, O*) is the squared multiple correlation for all 3 sets. The "O_9" set includes the 9 other outcome measures at the 12th grade. For example, when Percent to College is the dependent variable "O_9" set includes Percent Nonwhite to College, Percent Total and Nonwhite to Postsecondary Training, Percent of Dropouts, Expectations, Attitude, Educational Plans, Study Habits, and Achievement. The "O_5" set includes these latter 5 variables. The "O_4" set includes 4 of the latter 5 variables where the 5th is the dependent variable. For example, when Expectations is the dependent variable "O_4" includes Attitude, Educational Plans, Study Habits, and Achievement.

Table 9.3.2 gives the additional contribution to the dependent variable made by the special 12th-grade outcome measures of Percent Total and Nonwhite Going on to College, Percent Total and Nonwhite Going on to Postsecondary Vocational Training, and Percent of Boy Dropouts. The top half of the table compares the squared multiple correlations for the *B*, *S*, and nine other outcome measures (O_9) with the squared multiple correlations for the *B*, *S*, and five other outcome measures (O_5).[3] Inspection of the "DIFFERENCE" row in the upper half of this table shows that, except in the case of Boy Dropouts, the special 12th-grade outcome measures do make an additional contribution to prediction of the dependent variables. This contribution is greatest for the Percent Nonwhite Going on to College and Postsecondary Training, and considerably smaller for the Percent of Total Going on to College and Postsecondary Training.

The bottom half of Table 9.3.2 compares the squared multiple correlations for the *B*, *S*, and O_9 with the squared multiple correlations for *B*, *S*, and O_4. The "DIFFERENCE" row in the bottom half of this table shows that the five special 12th-grade measures do contribute to the prediction of Expectations and Educational Plans and, though only slightly, to Study Habits. They do not however, improve the prediction of Attitude Toward Life or of Achievement.

Table 9.3.2 shows that *O* does make a substantial contribution to each of the dependent variables. The next question, then, is: To what extent does *O* share some of the predictable variance with *B* and *S*? The commonality analyses in table 9.3.3 are intended to answer this question. Inspection of this table shows that for each set of variables there is an increase in predictability through the ninth grade and then a decrease at the 12th grade. The O_9 set at the 12th grade shows an increase in predictability when compared with the O_4 set. The most prominent feature of this table is that Expectations is more predictable from *O* than it is from either *B* or *S*. Also of interest are the small unique portions for *B* and *S* at grades three and six. It should be noted that at grades nine and 12 they increase slightly for *B* and substantially for *S*. These and other results suggest that *O* makes a large contribution in the prediction of Expectations, and also shares variance with both *B* and *S*.

Table 9.3.4 presents commonalities for Attitude Toward Life. As with Expectations, Attitude Toward Life is more predictable from *O* than from either *B* or *S*. The predictability for each set increases through the ninth grade and then decreases somewhat at the 12th grade. The special 12th-grade Outcome measures (O_9) fail to add any information not already contained in the

[3] For the composition of O_5 and O_9 see p. 73.

Table 9.3.3.—Squared Multiple Correlations [1] of B, S, and O for Expectations, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables														
	3d			6th			9th			12th (O_4) [3]			12th (O_9) [3]		
	B	S	O	B	S	O	B	S	O	B	S	O	B	S	O
First order:															
U(B)	02			01			01			02			02		
U(S)		02			02			05			14			13	
U(O)			20			22			17			19			22
Second order:															
C(BS)				01	01					03	03		02	02	
C(BO)	17		17	25		25	45		45	05		05	04		04
C(SO)		01	01		01	01		06	06		11	11		12	12
Third order: C(BSO)	05	05	05	19	19	19	07	07	07	11	11	11	11	11	11
R^2 for a single set of variables	24	08	43	46	23	66	52	18	74	20	38	45	20	38	50

[1] Rounded to 2 places of decimals after computation, leading decimals and zero's omitted.

[2] The squared multiple correlations obtained when all 3 sets are entered into the regression for the different grade levels are: 3d, 47; 6th, 71; 9th, 80; 12th (O_4), 63; 12th (O_9), 66. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

[3] The "O_4" designates the 4 outcome measures of: Attitude Toward Life; Educational Plans; Study Habits; and Achievement. The "O_9" designates the 4 variables included in the "O_4" set *plus* the additional 5 measures of Percent Total and Nonwhite to College, Percent Total and Nonwhite to Postsecondary Training and Percent of Boy Dropouts.

O_4 set. The unique association values for the *B* and *S* sets are small but increase slightly at the higher grade levels. The unique portions for *O* are much larger than for the other unique portions. However, most of the predictable variance in Attitude Toward Life is bound up in the second- and third-order commonality coefficients. There is a progressive increase in the second-order commonality for *B* and *O* through the ninth grade, after which it diminishes. The third-order commonality coefficient increases progressively at the higher grade levels. Clearly, in predicting Attitude Toward Life, *O* both makes a large unique contribution and shares an even larger portion of the variance with *B* and *S*.

Table 9.3.5 presents the three-set commonality analyses for Educational Plans and Desires. The predictability for each set increases at the higher grade levels and is greatest for *O* until the ninth grade. After this *B* takes a slight lead which it retains until the special 12th-grade measures, O_9, are brought into the analysis. This substantially increases the predictability of *O*. The unique portion for *B* and *S* increases slightly at the higher grade levels, while the *O* set values diminish somewhat. This trend is altered at the 12th grade when the special 12th-grade measures are brought into the analysis. These special measures increase the unique value of *O* and decrease that of *B* and *S*. As with the earlier dependent variables, most of the predictable variance is bound up with the second- and third-order commonalities. A slightly different trend emerges for the second-order commonalities, which are somewhat larger for *B* and *S* than for the earlier measures. However, most of the predictable variance is still bound up with the second-order commonality for *B* and *O* and with the third-order commonality. The second-order commonality, *C(BO)*, increases in value at the sixth and ninth grades, while the third-order commonality increases at the sixth grade and then progressively diminishes. As before, this trend is altered at the 12th grade when the special 12th-grade measures, O_9, are brought into the analysis. Here, the second-order commonalities for *BO* and *SO* are increased, as is the third-order commonality. The commonality trends for Educational Plans indicate a large unique contribution and a large portion of shared variance of the *B* and *S* sets with *O*. In this they resemble the trends observed for the earlier dependent variables.

Table 9.3.4.—Squared Multiple Correlations [1] of B, S, and O for Attitude Toward Life, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables														
	3d			6th			9th			12th (O_4) [3]			12th (O_9) [3]		
	B	S	O	B	S	O	B	S	O	B	S	O	B	S	O
First order:															
U(B)	04			01			01			04			03		
U(S)		06			01			02			04			03	
U(O)			14			21			15			14			15
Second order:															
C(BS)	01	01					01	01		04	04		03	03	
C(BO)	15		15	28		28	28		28	10		10	10		10
C(SO)					01	01		03	03		04	04		04	04
Third order: C(BSO)	03	03	03	28	28	28	29	29	29	31	31	31	31	31	31
R^2 for a single set of variables	22	09	30	57	30	78	58	35	76	48	42	59	48	42	60

[1] Rounded to 2 places of decimals after computation, leading decimals and zero's omitted.

[2] The squared multiple correlations obtained when all 3 sets are entered into the regression for the different grade levels are: 3d, 41; 6th, 80; 9th, 79; 12th (O_4), 70; 12th (O_9), 71. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

[3] The "O_4" designates the 4 outcome measures of: Expectations, Educational Plans; Study Habits; and Achievement. The "O_9" designates the 4 variables included in the "O_4" set plus Percent Total and Nonwhite to College, Percent Total and Nonwhite to Postsecondary Training and Percent of Boy Dropouts.

Table 9.3.5.—Squared Multiple Correlations [1] of B, S, and O for Educational Plans and Desires, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables														
	3d			6th			9th			12th (O_4) [3]			12th (O_5) [3]		
	B	S	O	B	S	O	B	S	O	B	S	O	B	S	O
First order:															
U(B)				01			07			07			04		
U(S)		02			02			05			08			05	
U(O)			17			21			11			12			15
Second order:															
C(BS)				02	02		08	08		14	14		07	07	
C(BO)	07		07	19		19	26		26	13		13	15		15
C(SO)								02	02		06	06		10	10
Third order: C(BSO)	12	12	12	28	28	28	19	19	19	13	13	13	20	20	20
R^2 for a single set of variables	19	15	36	50	33	68	61	33	58	47	42	44	47	42	61

[1] Rounded to 2 places of decimals after computation, leading decimals and zero's omitted.

[2] The squared multiple correlations obtained when all 3 sets are entered into the regression for the different grade levels are: 3d, 29; 6th, 73; 9th, 78; 12th (O_4), 73; 12th (O_5), 77. The number of schools are 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

[3] The "O_4" designates the 4 outcome measures of: Expectations; Attitude Toward Life; Study Habits; and Achievement. The "O_5" designates the 4 variables included in the "O_4" set plus Percent Total and Nonwhite to College, Percent Total and Nonwhite to Postsecondary Training, and Percent of Boy Dropouts.

Table 9.3.6 presents commonality analyses for Study Habits. The predictability of Study Habits varies with the grade level and set under consideration. For example, the squared multiple correlation for *S* decreases at the higher grade levels, but increases through grade nine for *B* and *O*, and then decreases at grade 12. The unique associations for *B* and *S* increase at the higher grade levels, while those for *O* oscillate from low to high and back again. The second-order commonality increases through the ninth grade and then decreases. The third-order commonality, on the other hand, progressively decreases from the third grade on. The most important trend in this table is for the three sets to share less of the variance while the two-set combinations and the unique contributions increase in magnitude.

Commonality analyses for Achievement are presented in table 9.3.7. The picture that emerges here is very different from that given by the earlier dependent variables. Although for each individual set the squared multiple correlation increases at the higher grade levels, it is always *less* for *O* than for *B* and *S*. The unique portions are larger for *B* than for the other sets. The unique portions for *S* remain fairly similar from one grade level to the next, while those for *O* increase slightly at the higher grade levels. Most of the predictable variance is contained in the second-order commonality for *B* and *S* and in the third-order commonality. The second-order commonality for *B* and *S* increases through the sixth grade and then diminishes slightly. When O_5 is brought into the analysis, this coefficient decreases somewhat. The third-order commonality contains most of the predictable variance in Achievement; it increases in magnitude at the higher grade levels. The O_5 set increases the third-order coefficient when it is brought into the analysis. These results show that the greatest amounts of predictable variance are shared by *B* and *S* in combination with *O*, as well as in combination with one another. The three sets do make unique contributions, but the magnitudes are rather small.

Table 9.3.8 presents commonality analyses for the special 12th-grade measures. By far the largest percent of the predictable variance in Percent of Graduates Going on to College is contained in the third-order commonality coefficient. The *S* and *O* sets have moderate unique portions, while the unique portion for *B* is near zero. Commonality coefficients appear at the second order

Table 9.3.6.—Squared Multiple Correlations [1] of B, S, and O for Study Habits, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables														
	3d			6th			9th			12th (O_4) [3]			12th (O_5) [3]		
	B	S	O	B	S	O	B	S	O	B	S	O	B	S	O
First order:															
U(B)	04			01			09			18			19		
U(S)		04			01			02			08			09	
U(O)			07			22			09			16			17
Second order:															
C(BS)	06	06								02	02		−02	−02	
C(BO)	12		12	30		30	49		49	22		22	22		22
C(SO)		01	01		01	01		02	02		06	06		06	06
Third order: C(BSO)	26	26	26	26	26	26	16	16	16	03	03	03	04	04	04
R^2 for a single set of variables	49	36	46	57	28	79	74	20	76	42	16	48	42	16	48

[1] Rounded to 2 places of decimals after computation, leading decimals and zero's omitted.

[2] The squared multiple correlations obtained when all 3 sets are entered into the regression for the different grade levels are: 3d, 61; 6th, 81; 9th, 87; 12th (O_4), 72; 12th (O_5), 73. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

[3] The "O_4" designates the 4 outcome measures of: Expectations; Attitude Toward Life; Educational Plans; and Achievement. The "O_5" designates the 4 variables included in the "O_4" set plus Percent Total and Nonwhite to College, Percent Total and Nonwhite to Postsecondary Training, and Percent Boy Dropouts.

Table 9.3.7.—Squared Multiple Correlations [1] of B, S, and O for Achievement, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables														
	3d			6th			9th			12th (O_4) [3]			12th (O_9) [3]		
	B	S	O	B	S	O	B	S	O	B	S	O	B	S	O
First order:															
U(B)	05			06			07			05			05		
U(S)		04			04			03			03			03	
U(O)			01			01			02			03			04
Second order:															
C(BS)	19	19		30	30		27	27		24	24		17	17	
C(BO)	02		02	04		04	04		04	02		02	02		02
C(SO)					01	01		02	02		01	01		01	01
Third order: C(BSO)	26	26	26	39	39	39	45	45	45	51	51	51	58	58	58
R^2 for a single set of variables	53	49	29	79	73	45	82	76	52	82	79	57	82	79	65

[1] Rounded to 2 places of decimals after computation, leading decimals and zero's omitted.

[2] The squared multiple correlations obtained when all 3 sets are entered into the regression for the different grade levels are: 3d, 57; 6th, 84; 9th, 88; 12th (O_4), 90; 12th (O_9), 90. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

[3] The "O_4" designates the 4 outcome measures of: Expectations; Attitude Toward Life; Educational Plans; and Study Habits. The "O_9" designates the 4 variables included in the "O_4" set plus Percent Total and Nonwhite to College, Percent Total and Nonwhite to Postsecondary Training, and Percent Boy Dropouts.

for *BO* and *SO*. Unlike Achievement, Percent Going on to College is more predictable from *O* than from *B* and *S*. These results show that *O* and *S* make unique contributions in predicting the Percent Going on to College, but that the greatest contribution is made by the combination of *B*, *S*, and *O*.

For Percent Nonwhite Going on to College the squared multiple correlation is largest for *O* and next largest for *S*. The value for *B* is very small. Most of the predictable variance is contained in the unique portions and second-order commonality for *S* and *O*. A small amount is contained in the third-order commonality. These results show that it is the unique portions of *S* and *O*, combined with a slight shared variance, that accounts for most of the predictable variance in Percent Nonwhite Going on to College.

Most of the predictable variance in Percent Going on to Postsecondary Vocational Training is accounted for by the unique association of *S*. There is also a small unique portion of *O*. The higher order commonalities are near zero except for the *S* and *O* combination. A small portion of the variance is shared by *S* with *O*. Nevertheless, most of the differences among schools in their Percent of Graduates Going on to Postsecondary Training can be accounted for by *S*.

For Percent Nonwhite Going on to Postsecondary Training the trend is very comparable to Percent Nonwhite Going on to College, and the same kinds of remarks would be applicable.

The highest squared multiple correlation for the Percent of Boy Dropouts is with *S*. The values for *B* and *O* are much lower and closer together. Most of the predictable variance is accounted for by the unique portion of *S*, and the slight shared variance of *S* and *O*, and the larger portion of variance shared by all three sets. Clearly, *S* makes a large contribution to differences among schools in their dropout rates.

Regression and commonality analyses were conducted using *B*, *S*, and *O* with the dependent variables of: Expectations, Attitude Toward Life, Educational Plans and Desires, Study Habits, and Achievement. Use was also made of the additional 12th-grade dependent variables of Percent Total and Nonwhite Graduates Going on to College, Percent Total and Nonwhite Graduates Going on to Postsecondary Vocational Training, and the Percent of Boy Dropouts.

Table 9.3.8.—Squared Multiple Correlations [1] of B, S, and O for Special 12th-Grade Outcome Measures, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables														
	Percent to college			Percent nonwhite to college			Percent to postsecondary training			Percent nonwhite to postsecondary training			Percent boy dropouts		
	B	S	O	B	S	O	B	S	O	B	S	O	B	S	O
First order:															
U(B)	01			01			01			01			03		
U(S)		10			11			23			11			20	
U(O)			10			21			06			20			02
Second order:															
C(BS)										01	01		−02	−02	
C(BO)	05		05	01		01									
C(SO)		09	09		07	07		03	03		08	08		04	04
Third order: C(BSO)	32	32	32	02	02	02	01	01	01	02	02	02	09	09	09
R^2 for a single set of variables	38	51	56	05	20	32	02	26	09	05	23	31	10	32	15

[1] Rounded to 2 places of decimals after computation, leading decimals and zero's omitted.

[2] The "*O*" set contains the 9 other outcome measures. For example, when Percent to College is the dependent variable the "*O*" set contains Percent Nonwhite to College, Percent Total and Nonwhite to Secondary Training, Percent Boy Dropouts, Expectations, Attitude, Educational Plans, Study Habits, and Achievement. The squared multiple correlation obtained when all 3 sets are entered into the regression are: Percent to College, 67; Percent Nonwhite to College, 44; Percent to Postsecondary Training, 33; Percent Nonwhite to Postsecondary Training, 44; Percent Boy Dropouts, 36. There were 780 schools in these analyses.

To make causal inferences from this associational data we will make the same kinds of assumptions as in chapter 5. It was assumed there that some degree of proportionality existed between: (i) the percent of variance that could be apportioned to a set of variables independently of other sets; (ii) the causal influence of that set. This was called the set's "independent role or contribution;" it was contrasted with "common role or contribution" (see p. 53).

The relative roles of the sets of variables used in a regression analysis can vary markedly. If sets X and Y have similar correlations with the dependent variable, and if the correlation of X with Y is high, then the unique contribution of each set will be small and the degree of overlap or commonality coefficient will be large. The effect is strengthened if the correlations within each set are also similar. The magnitude of the commonality will depend upon the magnitude of the correlations within and betwen the X and Y sets, as well as on the magnitude of their correlations with the dependent variables. When a third set, Z, is introduced which is more highly correlated with one set than with the other, the relative roles of the X and Y sets (viz, the uniques and the commonality) will change in order to accommodate this new set. If Z has variance which is shared with (let us say) X, and has similar dependent variable correlations, then the unique contribution of X will decrease in order to emerge as a second-order commonality with Z. What was formerly called a unique cause can still be causal, but the causation is now shared by the two sets. Similarly, if the new set, Z, has variance in common with X and Y, and if all three have similar dependent variable correlations, then this common variance will emerge in the third-order commonality. Also, if the two sets, X and Y, do not have much variance in common with Z, then their second-order commonality will be similar to what it was before Z was introduced.[4]

With these considerations in mind, let us proceed to the causal inferences. They will be organized around the different individual outcome measures, but will also emphasize major trends common to two or more individual outcome measures.

The set of Outcome measures (O) for each dependent variable (i.e., each individual outcome) was found to make substantial independent contributions to the dependent variable after the Student Body Background (B) and School (S) sets had been entered into the regression. These contributions were much larger for Expectations, Attitude Toward Life, Educational Plans and Desires, and Study Habits than for Achievement. For Expectations, as well as Educational Plans and Desires, the contribution of O was somewhat smaller at the higher than at the lower grades. For Attitude Toward Life, the contribution increased through the sixth grade, and then decreased. For Study Habits, the contribution oscillated from low to high and back again in moving from the lower to the higher grade levels. For Achievement, the other Outcome measures made a very small independent contribution that increased progressively at the higher grade levels. When the special 12th-grade measures were brought into the analysis they made slight to substantial contributions to all the dependent variables except Percent of Boy Dropouts, Attitude Toward Life, and Achievement.

Commonality analyses showed that the attitudinal and motivational measures had similar trends over the grade levels. Each of the four dependent variables of Expectations, Attitude Toward Life, Educational Plans, and Study Habits tends to be more predictable from O than from B or S. For each of these variables the Outcome measures had moderate-to-large independent roles that were almost always larger than the independent role for B and S. However, most of the contributions to these dependent variables was made by the two-way common role of B and O and by the three-way common role of B, S, and O.

A somewhat different picture emerges for Achievement, which was most predictable from B, somewhat predictable from S, and least predictable from O (although the level of predictability here was still substantial). The independent contribution was greatest for the Student Body variables. The contribution of O increased at the higher grade levels while the contribution of S declined somewhat. Both, however, were fairly close in magnitude at grades nine and 12. As with the other dependent variables, most of the contribution to Achievement lay in the common role of O and S. In contrast, the two-way combination that may wield the greatest influence was that of B with S. An even greater influence may be wielded by the three-way combination of B, S, and O. The common role of the three sets combined outweighed the lower order contributions. Thus at the third grade the influence of this three-way combination was about 1½ times as great as the largest value for the lower order commonalities. By the 12th grade its influence was about 3 times as great as the largest lower order commonality.

There was a moderate independent contribution of S and O for the special 12th-grade dependent variable of Percent Going on to College. A common contribution was also made by these sets in the second order. Most of the contribution, however, was made by the three-way combination of B, S, and O. For the other special 12th-grade dependent variables the common roles for the two- and three-set combinations were much smaller. The greatest roles were played by the independent contributions of the different sets. For Percent Nonwhite Going on to College and for Percent Nonwhite Going on to Postsecondary Vocational training, the largest independent contributions were made by O and S. These sets also had a two-way common contribution and a slight three-way contribution with B. For the Percent of Total Going on to Postsecondary Training the largest contribution was made by S, with O making a small independent contribution. The greatest role in Percent Going on to Postsecondary Training was played by these independent contributions; the common role of S and O was only a small

[4] These relationships are further discussed in appendix II.

one. For Percent of Boy Dropouts the largest contributions, which happened to be independent, was made by *B*. A common role was shared not only by *S* and *O* but (to an even greater extent) by *B*, *S*, and *O*.

We have seen that *O* played a significant role—independent, cooperative, and both—in contributing to individual school outcomes. These results show that schools that do well on one school outcome tend also to do well on others. They also show that these outcomes may be bound up with the students' social background, as we have defined it, and that these multiple outcomes may be mutually reinforcing and facilitating. We cannot build a particularly conclusive case for the latter part of this assertion, but the results are suggestive. In order to demonstrate more conclusively that multiple school outcomes are mutually reinforcing, we would like to show that the internal intercorrelations of the *B* and *S* sets of variables, as well as their correlations with each other, remain fairly stable over the grade levels. On the other hand, the correlations of *B* and *S* with the individual outcomes increase as one ascends the grade levels. These conditions would give strong support to the assertion that the schools are having an influence on the students that is bound up with their social background. If in addition we could show that the School Outcome measures become more highly intercorrelated as one ascends the grade levels, then this trend would more strongly support the notion that multiple School Outcomes are mutually reinforcing.

Inspection of the intercorrelations of the outcome measures at the different grade levels in tables 5.2.1 and 5.2.2 shows that these trends do not occur exactly in the manner expected. The intercorrelations do increase from grades three to six. But then they decline again, especially at grade 12. Can these trends be demonstrated? It appears that, for a number of reasons, they cannot. Sparse representation of the indices at the lower grade levels, higher nonresponse rates at these same levels,[5] unreliability of the responses of younger students[6]—all these factors combine to prevent it. Other such factors are that students of more dissimilar backgrounds tend to be aggregated into schools at the higher grade levels, and that dropouts start occurring at the higher grade levels. Because of these countertrends we can only conclude that these outcomes *may* be mutually reinforcing.

[5] Because students and teachers know less about parents' occupation and education.

[6] Because their attitudes are less well developed and articulated.

10. Further Analysis of School Personnel and Personnel Expenditures

10.1. SELECTION OF SUBSETS

We have seen that the set of variables most heavily involved in school outcomes is School Personnel and Personnel Expenditures (pp. 48–54). It has also been suggested that the influence of the schools is bound up with the kinds of students they get initially, and that very little of this influence can be attributed to them independently of their students' social background, as we have defined it (p. 41). In this chapter, we shall attempt to find out if, among the 17 variables that make up School Personnel and Personnel Expenditures some subsets are more influential than others. In addition 10 other personnel variables have been brought into the analysis. These are designated below by an asterisk. Variables related to personnel expenditures—specialized personnel services, for instance, or training and credits beyond the highest degree—have been brought together in an attempt at determining to what extent they had a unique portion, and to what extent a shared portion, of variance with the other sets in predicting school outcomes. This particular subset is as follows:

F: FISCAL (EXPENDITURE-RELATED) VARIABLES

(1) Principal's Training
(2) Specialized Staff and Services
(3) Principal's Credits Beyond Highest Degree*
(4) Teacher's Training
(5) Teacher's Credits Beyond Highest Degree*

Two other subsets were formed. These referred primarily to the school personnel's prior background and current teaching situation. It was felt that the personnel expenditure variables might have variance in common with either. For example, if expenditures variables were strongly related to school outcomes *and* to the kind of college attended by the teachers, then we would expect a large second-order commonality coefficient for these two sets of variables.

P: PERSONNEL'S BACKGROUND (INCLUDING COLLEGE ATTENDED)

(1) Principal's Experience
(2) Principal's College Attended
(3) Principal's Sex—Male or Female
(4) Teacher's Experience
(5) Teacher's Localism—Number of Areas Ever Served
(6) Teacher's Socio-Economic Background
(7) Teacher's College Attended
(8) Teacher's Sex—Male or Female
(9) Teacher's Racial-Ethnic Group Membership
(10) Percent of White Students at Teacher's Undergraduate Institution*
(11) Teacher's Vocabulary Score

T: TEACHING SITUATION

(1) Principal's Estimate of the Scope and Severity of School Problems* (destruction of property, stealing, racial tension, etc.)
(2) Principal's Estimate of the School's Reputation
(3) Teacher Turnover*
(4) Teacher Tenure*
(5) Teacher Exams* (i.e., use of teacher exams in the appointment process)
(6) Teaching Conditions
(7) Teaching-Related Activities
(8) Teacher's Preference for Student-Ability Level
(9) Percent White of Teacher's Students*
(10) Teacher's Assignment to Present School District*
(11) Number of Hours Per Day Spent in Classroom Teaching*

The outcome measures were the same as those used previously (page 41).

10.1.1. Commonality Analyses for B, F, P, and T

Student Body Social Background has already been designated as *B*. This section presents the results of commonality and regression analyses for *B*, *F*, *P*, and *T*. The main questions with which we are concerned here are:

(1) To what extent can the predictable variance in School Outcomes (as indicated by the squared multiple correlation) be uniquely apportioned to our sets of personnel variables?

(2) To what extent is this predictable variance shared by different combinations of these sets of variables?

Emphasis will not be given to results at the third grade unless they are in alignment with the other grade levels. This is because the outcome indices, except for Achievement, tend to be sparsely represented at the third grade. For similar reasons, commonality coefficients of 0.01 or less will not be discussed.

Table 10.1.1.1 shows that the predictability of Expectations for Excellence (p. 13) from each set of variables, except for *B* at the 12th grade, increases for the higher

grade level. The unique portion of the association for *F*, *P*, and *T* increases at the higher grade levels, while the unique portion for *B* increases through the ninth grade and drops sharply at the 12th grade. The role played by *F* in Expectations, either individually or in combinations with the other sets of variables, is very small. Second-order commonalities do emerge at the ninth and 12th grade for *F* in conjunction with *P* and *T*, but they are slight.

In table 10.1.1.2 the same analyses are performed with the same variables for Attitude Toward Life (p. 13). As with Expectations, the higher the grade level, the greater the predictability from each of the four sets of variables.

Table 10.1.1.1.—Squared Multiple Correlations [1] of B, F, P, and T With Expectations, Expressed as a Function of their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables							
	3d				6th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	18				27			
U(F)								
U(P)			01				01	
U(T)				01				01
Second order:								
C(BF)								
C(BP)					02		02	
C(BT)	01			01	03			03
C(FP)								
C(FT)								
C(PT)								
Third order:								
C(BFP)								
C(BFT)								
C(BPT)	03		03	03	15		15	15
C(FPT)								
Fourth order: C(BFPT)								
R^2 for a single set of variables	24	01	04	06	46		18	19

Commonality coefficients [3]	Sets of regressor variables							
	9th				12th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	42				07			
U(F)		01				03		
U(P)			03				06	
U(T)				01				07
Second order:								
C(BF)								
C(BP)	02		02					
C(BT)	12			12	03			03
C(FP)		01	01					
C(FT)		01		01		04		04
C(PT)							01	01
Third order:								
C(BFP)	−01	−01	−01		02	02	02	
C(BFT)	01	01		01	−02	−02		−02
C(BPT)	−02		−02	−02	09		09	09
C(FPT)		01	01	01		−01	−01	−01
Fourth order: C(BFPT)	−02	−02	−02	−02	01	01	01	01
R^2 for a single set of variables	52	03	03	13	20	07	18	21

[1] Rounded to 2 places of decimals after computation, leading decimals and zeros omitted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 26 and 6th, 49. The number of schools are: 3d, 2,453 and 6th, 2,372.

[3] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 9th, 61 and 12th, 39. The number of schools are: 9th, 923 and 12th, 780.

Table 10.1.1.2.—Squared Multiple Correlations [1] of B, F, P, and T With Attitude Toward Life, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables							
	3d				6th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	19				29			
U(F)								
U(P)			02				01	
U(T)				01				01
Second order:								
C(BF)								
C(PB)	−02		−01		03		03	
C(BT)	02			02	03			03
C(FP)								
C(FT)								
C(PT)			01	01				
Third order:								
C(BFP)								
C(BFT)								
C(BPT)	01		01		20		20	20
C(FPT)								
Fourth order: C(BFPT)					01	01	01	01
R^2 for a single set of variables	22	01	04	06	57	01	25	25

Commonality coefficients [3]	Sets of regressor variables							
	9th				12th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	31				12			
U(F)						01		
U(P)			01				01	
U(T)				02				03
Second order:								
C(BF)								
C(BP)	01		01		03		03	
C(BT)	06			06	05			05
C(FP)						01	01	
C(FT)								
C(PT)								
Third order:								
C(BFP)								
C(BFT)	01	01		01				
C(BPT)	20		20	20	29		29	29
C(FPT)								
Fourth order: C(BFPT)								
R^2 for a single set of variables	58	02	23	29	48	02	34	37

[1] Rounded to 2 places of decimals after computation, leading decimals and zeros omitted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different levels are: 3d, 27; 6th, 59; 9th, 63; 12th, 55. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

[3] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different levels are: 3d, 27; 6th, 59; 9th, 63; 12th, 55. The number of schools are: 3d, 2,453; 6th, 2,372; 9th, 923; 12th, 780.

However, the predictability from B drops at the 12th grade, and the unique portions for *F*, *P*, and *T* increases only slightly at the higher grade levels. In contrast, the unique portion of the association for *B* increases progressively through the ninth grade. But at the 12th grade it drops sharply. As for F, the second-, third-, and fourth-order commonalities show that it has virtually no variance in common with the other sets of variables. Among these, most of the predictable variance in *P* and *T* is contained in the second- and third-order commonalities, and is shared with *B*. It is largest for the third-order commonality coefficient involving *B*, *P*, and *T*.

The next outcome measure in our analysis is Educational Plans and Desires (table 10.1.1.3). Its predicta-

Table 10.1.1.3.—Squared Multiple Correlations [1] of B, F, P, and T With Educational Plans and Desires, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables: 3d				6th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	07				21			
U(F)						01		
U(P)			01				01	
U(T)				02				
Second order:								
C(BF)					01	01		
C(BP)					04		04	
C(BT)	04			04	07			07
C(FP)								
C(FT)								
C(PT)								
Third order:								
C(BFP)					01	01	01	
C(BFT)					01	01		01
C(BPT)	07		07	07	14		14	14
C(FPT)								
Fourth order: C(BFPT)	01	01	01	01	02	02	02	02
R^2 for a single set of variables	19	02	08	13	50	06	21	24

Commonality coefficients [2]	Sets of regressor variables: 9th				12th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	37				16			
U(F)						01		
U(P)			02				03	
U(T)				02				09
Second order:								
C(BF)	02	02			04	04		
C(BP)	01		01		02		02	
C(BT)	13			13	24			24
C(FP)								
C(FT)						02		02
C(PT)			01	01			01	01
Third order:								
C(BFP)	02	02	02		−01	−01	−01	
C(BFT)					01	01		01
C(BPT)	04		04	04	01		01	01
C(FPT)						01	01	01
Fourth order: C(BFPT)	03	03	03	03				
R for a single set of variables	61	08	11	22	47	08	06	37

[1] Rounded to 2 places of decimals after computation, leading decimals and zeros omitted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 21 and 6th, 52. The number of schools are: 3d, 2,452 and 6th 2,372.

[3] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 9th, 66 and 12th, 62. The number of schools are: 9th, 923 and 12th, 780.

bility varies somewhat for each set of variables as one ascends the grade levels (see R^2 for a single set of variables). For F and T there is an increase in the R^2 at the higher grade levels. The increase in B, however, gives way to a decrease at the 12th grade. P increases only through the sixth grade; at the ninth grade it decreases, as it does again at the 12th grade. The unique portions increase for F, P, and T at the higher grades, while the unique portion for B increases through the ninth grade and then decreases at the 12th. At the ninth and 12th grades, a slight commonality coefficient can be discerned for F in conjunction with B, and for F in conjunction with B and P at the sixth and ninth grades. However, most of the predictable variance in Educational Plans is contained in the second- and third-order commonalities for B, P, and T at grades six, nine, and 12. Between the sixth and the ninth and the ninth and the 12th grades, the predictable variance shifts in a curious fashion from the third-order commonality for B, P, and T to the second-order commonality for B and T. Evidently, at grades six and nine B and T assume a greater role, while that of P decreases. A small amount of the predictable variance in Educational Plans is shared by all four sets of variables at the sixth and ninth grades. This can be seen from their fourth-order commonality coefficients.

The predictability of Study Habits (table 10.1.1.4) for each set of variables (see R^2 for a single set of variables)

Table 10.1.1.4.—Squared Multiple Correlations [1] of B, F, P, and T With Study Habits, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables: 3d				6th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	16				33			
U(F)		01						
U(P)			01				01	
U(T)								01
Second order:								
C(BF)	01	01						
C(BP)	02		02		03		03	
C(BT)	06			06	04			04
C(FP)								
C(FT)								
C(PT)								
Third order:								
C(BFP)	01	01	01					
C(BFT)								
C(BPT)	20		20	20	16		16	16
C(FPT)								
Fourth order: C(BFPT)	02	02	02	02	01	01	01	01
R^2 for a single set of variables	49	06	26	30	57	02	21	22

Commonality coefficients [2]	Sets of regressor variables: 9th				12th			
	B	F	P	T	B	F	P	T
First order:								
U(B)	58				39			
U(F)						03		
U(P)			02				03	
U(T)				01				02
Second order:								
C(BF)					−02	−02		
C(BP)								
C(BT)	06			06	03			03
C(FP)						01	01	
C(FT)						−01		−01
C(PT)							01	01
Third order:								
C(BFP)								
C(BFT)	01	01		01	01	01		01
C(BPT)	08		08	08	01		01	01
C(FPT)								
Fourth order: C(BFPT)	01	01	01	01				
R^2 for a single set of variables	74	02	11	16	42	02	06	07

[1] Rounded to 2 places of decimals after computation, leading decimals and zeros omitted.

[2] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 3d, 52 and 6th, 60. The number of schools are: 3d, 2,453 and 6th, 2,372.

[3] The squared multiple correlations obtained when all 4 sets are entered into the regression for the different grade levels are: 9th, 77 and 12th, 51. The number of schools are: 9th, 923 and 12th, 780.

varies with the grade level. *B* increases through grade nine and then decreases at grade 12. *P* and *T* decrease at the higher grade levels. *F*, after starting out low, remains low, even at these levels. The unique portions for *B* increase slightly at the higher grade levels. The higher order commonalities for *F* are negligible; very small coefficients appear at the 12th grade in conjunction with *P* at the second order, and with *B* and *T* at the third order.

Most of the predictable variance in study Habits is in the unique portions at the higher grade levels, and in the second- and third-order commonality coefficients of *B*, *P*, and *T* at grades three, six, and nine. These results suggest that *F* may play a slight but independent role in Study Habits at the 12th grade. However, most of the predictable variance is accounted for by: (1) the unique portion for *B*; (2) the shared variance of *P* and *T* with *B*.

The squared multiple correlations of *B*, *F*, *P*, and *T* with Achievement show a progressive increase at the higher grade levels (table 10.1.1.5). But this increase lasts only as far as the ninth grade for *F*. The unique portions are small for all the personnel variables, especially *F*, while the unique portions for *B* increase progressively through the ninth grade and then decrease at the 12th grade. *F* shares some variance with *B* at the second order, and with *B* and *P* at the third order, for the ninth and 12th grades. But in Achievement, as with the preceding outcome measures, most of the predictable variance is contained in the second- and third-order commonality coefficients for *B*, *P*, and *T*. Some variance is also common to all four sets for grades one through nine. These results suggest that *P* and *T* may play a large role in the development of Achievement through their shared variance with B. A somewhat smaller role may be played by *F* through its common variance with *B* and *P*.

The five special 12th-grade outcome measures (p. 41) present a rather diversified picture in conjunction with our four sets of variables (table 10.1.1.6). Percent Going on to College is moderately predictable from *T* and *B*, less so from *P*, and much less so from *F*. The unique associations are largest for *T*, next largest for *B* and *P*, and near zero for *F*. In fact, *F* has a very low commonality with *T* at the second order and with all three other sets at the fourth order. However, most of the predictable variance in Percent Going on to College is contained in the second-order commonality for *B* and *T* and in the third-order commonality for *B*, *P*, and *T*. These results suggest that the unique portion for *T* and *B*, as well as their common portions with one another and with *P*, may play a role in influencing Percent of Graduates Going on to College.

The other four outcome measures in table 10.1.1.6 tend to be less predictable than Percent Going on to College for each of the individual sets of variables with the exception of *F*. For this latter set, the squared multiple correlations remain about the same for Percent Nonwhite Going on to College and Percent Going on to Postsecondary Training. They drop somewhat for Percent Nonwhite Going on to Postsecondary Training, and increase for Percent of Boy Dropouts (a measure that has a 0.87 correlation with Percent of Girl Dropouts). The unique portions for *B* are smaller for these latter four measures than for Percent Going on to College, while the unique portions for *F*, *P*, and *T* are usually larger. *F* has a slight unique portion for Percent Nonwhite Going on to College, and a slight second-order commonality with *P* and *T*. Most of the predictable variance is contained in the unique portions of *P* and *T*, especially in their third-order commonality with *B*, and the second-order commonality of *T* and *P*. It seems that, even if *F* plays a small role in Percent Nonwhite Going on to College, the greatest role is played by *P* and *T*.

Table 10.1.1.5.—Squared Multiple Correlations [1] of B, F, P, and T With Achievement, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables: 1st				3d			
	B	F	P	T	B	F	P	T
First order:								
U(B)	05				07			
U(F)						01		
U(P)			03				02	
U(T)				04				02
Second order:								
C(BF)					01	01		
C(BP)	01		01		14		14	
C(BT)	10			10	02			02
C(FP)								
C(FT)								
C(PT)								
Third order:								
C(BFP)								
C(BFT)					01	01		01
C(BPT)	25		25	25	25		25	25
C(FPT)								
Fourth order: C(BFPT)	01	01	01	01	02	02	02	02
R^2 for a single set of variables	43	03	30	40	53	05	43	32

Commonality coefficients [3]	Sets of regressor variables: 6th				9th				12th			
	B	F	P	T	B	F	P	T	B	F	P	T
First order:												
U(B)	09				09				04			
U(F)										01		
U(P)			02				01				01	
U(T)				01				01				03
Second order:												
C(BF)	01	01			02				04	04		
C(BP)	05		05		05		05		01		01	
C(BT)	13			13	10			10	12			12
C(FP)												
C(FT)										−01		−01
C(PT)												
Third order:												
C(BFP)	01	01	01		04	04	04		02	02	02	
C(BFT)	01	01		01	−01	−01		−01				
C(BPT)	47		47	47	49		49	49	59		59	59
C(FPT)												
Fourth order:												
C(BFPT)	02	02	02	02	05	05	05	05				
R^2 for a single set of variables	79	05	57	63	83	11	64	64	82	06	63	73

[1] Rounded to two places of decimals after computation, leading decimals and zeros omitted.

[2] The squared multiple correlations obtained when all four sets are entered into the regression for the different grade levels are: 1st, 50; and 3d, 56. The number of schools are: 1st, 1,302; and 3d, 2,453.

[3] The squared multiple correlations obtained when all four sets are entered into the regression for the different grade levels are: 6th, 82; 9th, 86; and 12th, 87. The number of schools are: 6th, 2,372; 9th, 923; and 12th, 780.

Table 10.1.1.6.—Squared Multiple Correlations [1] of B, F, P, and T With Special 12th-Grade Outcome Measures, Expressed as a Function of Their Unique Association and Their Commonality Coefficients

Commonality coefficients [2]	Sets of regressor variables: Percent going on to college				Percent nonwhite going on to college				Percent going on to postsecondary training				Percent nonwhite going on to postsecondary training				Percent of boy dropouts			
	B	F	P	T	B	F	P	T	B	F	P	T	B	F	P	T	B	F	P	T
First order:																				
U(B)	05				01				01				01				02			
U(F)						03				06				01				04		
U(P)			03				04				05				05				11	
U(T)				13				08				04				03				05
Second order:																				
C(BF)	01	01															−01	−01		
C(BP)	01		01						01		01						−02		−02	
C(BT)	17			17	03			03	01			01	02			02	08			08
C(FP)						02	02			02	02							−01	−01	
C(FT)		01		01		01		−01		−02		−02		01		01		03		03
C(PT)							−01	−01											01	01
Third order:																				
C(BFP)	01	01	01						−01	−01	−01						01	01	01	
C(BFT)													−01	01		−01	−02	−02		−02
C(BPT)	12		12	12	02		02	02					03		03	03	04		04	04
C(FPT)																		02	02	02
Fourth order: C(BFPT)	01	01		01	−01	−01	−01	−01												
R^2 for a single set of variables	38	04	17	44	05	05	06	13	02	05	07	03	05	02	08	09	10	07	16	21

[1] The squared multiple correlations obtained when all 4 sets are entered into the regression are: Percent Going on to College, 55; Percent Nonwhite Going on to College, 22; Percent Going on to Postsecondary Vocational Training, 16; Percent Nonwhite Going on to Postsecondary Vocational Training, 15; Percent of 10th-Grade Boys Who Drop Out Before Completion of the 12th Grade; 35. There were 780 schools included in these analyses.

[2] Rounded to two places of decimals after computation, leading decimals and zeros omitted.

A different situation is encountered for Percent Going on to Postsecondary Training. For this outcome, *F* has the next-to-largest squared multiple correlation (the largest being for *P*) and the largest unique portions. For Percent Nonwhite Going on to Postsecondary Training, *F* has the lowest squared multiple correlation, and the next-to-lowest unique portion (the lowest unique portion being for *B*).

Percent of 10th-Grade Boys Who Drop Out Before Completion of the 12th Grade is most predictable (see R^2 for a single set) from *T* and *P*. It is less predictable from *B*, and least predictable from *F*. The largest unique portion is for *P*. *T* and *F* have lower but similar unique values; *B* has the lowest value. There are slight to appreciable commonalities for *F* and *T* at the second order, and for *F*, *P*, and *T* at the third order. In short, there are appreciable independent contributions made by *P*, *T*, and *F*, as well as variance shared by these three sets with one another.

10.1.2 Possible Causal Inferences

We have seen that the two sets of variables most heavily involved in school outcomes are Other School Outcomes (chapter 9) and School Personnel and Personnel Expenditures (chapter 5). In order to make causal inferences from these associational data we will adopt the same kinds of assumption as those made in chapter 5. There it was assumed that there is some degree of proportionality between a dependent variable's independent role or contribution and its causal influences. "Independent role or contribution" was defined as the percent of its variance associated with a set of variables independently of other sets. The term "common role or contribution" was used to indicate that we could ascertain neither of two things: (1) the extent to which variance shared by two or more sets of variables should be apportioned to one or the other of the sets; (2) the extent to which the sets themselves may share some of the influence. The following inferences are organized around the outcome measures. The letters *B*, *F*, *P*, and *T* designate the same sets of variables as in the first part of this chapter.

Expectations for Excellence.—The independent contributions of *B* to Expectations were found to increase progressively through the ninth grade. At the 12th grade, however, they dropped sharply. Part of this may be due to the dramatic shift in Expectations of nonwhite schools at the 12th grade (see table 4.3.7 in chapter 4). At the lower grades Expectations of white schools exceed those for nonwhite, but at the 12th grade the opposite occurs. The independent contributions of *F* to Expectations are slightly larger at the ninth and 12th grades. But even there, they are still small. The independent contributions of *P* and *T* are also larger at the ninth and 12th grades, and may be largest at the 12th grade. A slight common role of *F* with *P* and *T* seems to exist at the ninth and 12th grades. But it is impossible to detect any important contribution made by *F* at the third and sixth grades, either individually or in combination. The most important influence on Expectations may be wielded through the common role of *B*, *P*, and *T*.

Attitude Toward Life.—The independent influence of *B* on Attitude Toward Life gets progressively larger through the ninth grade but drops sharply at the 12th grade. But *F*, *P*, and *T* exhibit no such progression; their independent influence becomes, at most, only slightly larger with the higher grades. In particular, *F* has virtually no influence, either individually or in combination, except a very small independent role at the 12th grade.

It may be that the greatest influence on Attitude Toward Life is the combination of *B*, *P*, and *T*. At any rate, the influence of these three sets combined is usually greater than that of any set by itself or in combination with only one of the other two sets.

Educational Plans and Desires.—The same role is played by *B* in Educational Plans and Desires as in the previous two outcomes: its independent influence increases through the ninth grade and then drops sharply at the 12th. The independent influence of *P* and *T* is larger at grade nine, and of *P*, *T*, and *F* at grade 12. The independent contribution of F at the 12th grade is very slight, but its common role with B increases progressively from grade six through 12. A common role of *F* with *B*, *P*, and *T* is found at the sixth and ninth grades (see the third- and fourth-order commonalities). The independent influence of *B* is still greater, especially in its common role with *P* and *T*. At the 12th grade, however, *T* also has an independent role.

Study Habits.—The independent contribution of *B* is as before. Despite the drop in its influence at grade 12, however, its magnitude relative to *F*, *P*, and *T* at this level remains quite large. The independent contributions of *P* and *T* increase slightly at the higher grade levels. The role of *F* is independent only at the 12th grade, where it also has a slight common role with *P*, *T*, and *B*. At the other grade levels it has virtually no relationship with the other sets. In fact, most of the influence in the development of Study Habits can be attributed to the independent role of *B*, and most of what remains to the common role of *P* and *T*. Even this remaining influence, however, is rather small.

Achievement.—The independent contribution of *B* to Achievement increases slightly from the lower grades onward until the ninth grade, when it begins to decrease. There is almost no independent contribution from *F*, and only small ones from *P* and *T*. What is apparent upon examination of the entire table (10.1.1.5) is that any possible influence of each of these four sets of variables on Achievement is bound up with the other three. The influence of *F*, however, is clearly less than that of the other sets; it does have a common role with them at the higher grade levels, but the really large contributions come from the common roles of the *B*, *P*, and *T*. Indeed, this commonness increases progressively with grade level, dramatically outweighing the role of *F*.

The 12th-grade outcome measures.—The largest independent roles in Percent Going on to College is played by *T* and *B*, with a smaller contribution from *P*. No independent influence is exerted by *F*, but it has a slight common role with the other three sets of variables. The major influence, however, may come from the independent and common roles of *T* and *B*, and the common role for *P*.

Most of the independent contribution to Percent Nonwhite Going on to College comes from *T* and *P*. A small independent contribution comes from *F*, and an even smaller one from *B*. Slight common roles are played by *B*, *P*, and *T*. The common role of *F* with *P* and *T* is the smallest of all. Clearly, most of the influence on Percent Nonwhite Going on to College stems from the independent roles of *F*, *P*, and *T*. The same may be true for Percent Going on to Postsecondary Training. The greatest role here is played by *F*, with *P* and *T* running just behind. Common roles for these sets are virtually nonexistent except for a slight one involving *F* and *P*. The greatest influence on Percent Nonwhite Going on to Postsecondary Training is exerted by the independent and common contributions of *P* and *T*, and by their common contribution with *B*. The independent role of F here is very small, but it does have a common role with *T*.

Finally, independent contributions are made by *F*, *P*, and *T* to the Percent of Dropouts. The greatest of these is made by *P*, followed closely by *T* and *F*. The independent contribution of *B* is very small. Slight common roles are played by *F* in conjunction with *P* and *T*, and larger ones by *B* in conjunction with *P* and *T*. It is possible that the greatest influences on Percent of Dropouts may come from the independent contributions of *F*, *P*, and *T*.

SUMMARY

We have seen that for the school outcomes we have labeled Expectations for Excellence, Attitude Toward Life, Educational Plans and Desires, and Study Habits and Achievement, a set of variables related to the school's personnel expenditures (*F*) makes a very small and sometimes nonexistent independent contribution. Furthermore, this set of variables exerts little or no influence through variance common with the other sets of variables with which we have been dealing in this analysis. On the other hand, the variables connected with the school personnel's background (*P*) and teaching situation (T) may be deeply involved with the student social background variables (*B*) in influencing the school outcomes.

We have also seen that, for a special set of 12th-grade outcome measures, although both the relative and the independent contributions of these same personnel expenditure variables was somewhat increased, the same trends tended to prevail. In other words, most of the influences on these outcomes could be attributed to the independent and common roles of the sets of variables connected with the school personnel's background and the teaching situation. The variables connected with the social background of the students usually played a lesser role. However, a reduced role was often observed for the student background variables with most of the outcome measures at the 12th grade (that is, with Expectations, Attitude Toward Life, etc.).

These results suggest that increases in personnel expenditures may result in only small improvements in school outcomes. A real answer to a question of this kind would require large-scale educational experimentation. What kinds of changes, then, would improve school outcomes? The answer must lie in the other sets of school personnel variables. One possible strategy would be to examine the regression coefficients of the variables in these different sets, and to attach causal importance to them. This could be misleading, however. The magnitudes and signs of these regression coefficients are highly de-

pendent upon the intercorrelations that exist among the variables being used. When the intercorrelations are high the coefficients can be particularly misleading. A second alternative that suggests itself is to look at the zero-order correlations to see which kinds of variables in each set are correlated with the outcomes. And these correlations have already been given in chapter 4. Inspection of tables 4.3.8 through 4.3.13 in chapter 4 reveals that the variables consistently related to the school outcomes (besides other Outcomes) include: (1) teacher's view of his teaching conditions (Teaching Conditions); (2) Teacher's Racial-Ethnic Group Membership; (3) Teacher's Vocabulary Score; (4) Percent of White Students at the Teacher's Undergraduate Institution; (5) Percent White of the Teacher's Students; (6) Socio-Economic Status of the students; (7) student's Family Structure; (8) the Racial-Ethnic Composition of the students. Variables 1 through 5 were also shown to be related to school outcomes, after certain statistical controls had been applied (see chapter 6). In this chapter, variables 2 through 4 were included in the School Personnel's Prior Background set, variables 1 and 5 in the Teaching Situation set, and variables 6 through 8 in the Student Body set. The important point to note is that these variables are correlated both with one another and with the School Outcomes. Moreover, it is these correlations that account in part for the common contributions of the different sets of variables. Perhaps, if the dependence of schools on the social background of students and school personnel were reduced through the achievement of a greater socioeconomic and racial balance, variables such as the teacher's training and the school's physical facilities might then play a greater role in influencing school outcomes. A more detailed discussion of these results, together with results from other chapters, is presented in chapter 11. These results also indicate that useful insights about the influence of teachers on their students might be gleaned from analyses of the teacher's background and preparation, especially the racial composition of the college he attended. The following section of this chapter presents some of these analyses.

10.2. ANALYSES OF INDIVIDUAL TEACHER'S BACKGROUND

The previous section of this chapter, together with the analyses in chapters 4 and 6, showed a substantial relationship between a school's outcomes and the aggregate or average social background of the teachers in it. Especially prominent in this relationship was the teacher's experience of racial imbalance, whether in their undergraduate institutions or on the school's teaching staff (for the latter, see table 5.3.2.3 in chapter 5). This section attempts to analyze various aspects of a teacher's background and training while omitting the aggregation by schools. In this way we hope to shed light on the development of variables that, in the aggregate, were shown to be related to school outcomes. For example, the *aggregate* Teacher's Vocabulary Score was shown to be related to Achievement (that is, to school achievement). In this section, however, we shall study different aspects of the background of *individual* teachers that are related to Teacher's Vocabulary Score.

10.2.1. Teachers and Their Schools

In moving the focus of our analysis from teachers aggregated by schools to the individual teacher, we are particularly interested in knowing how much of the total variance is associated with the schools in which each teacher is located. For example, if many schools have a preponderance of either older teachers or younger teachers then the variable of Teacher's Age will be associated with school differences. If, on the other hand, every school has about the same mix of younger and older teachers, then Teacher's Age will not be associated with school differences. A more formal way of expressing this kind of relationship might be

Let DAT = Total Differences Among Teachers in Attribute X

Let DAS = Total Differences Among Schools in Attribute X

Let DWS = Total Differences Among Teachers Within Schools in Attribute X

then

$$DAT = DAS + DWS.$$

By dividing this equation by DAT one can express DAS and DWS as percentages. Table 10.2.1 gives such percentages, for selected variables. It will be noted that this is equivalent to giving the ratio of the among-school variance to the total variance, corrected for the appropriate degrees of freedom.[1]

The percentages in table 10.2.1 represent upper limits for the amount of variance that can be accounted for by studying the correlates of school differences. If we were to obtain a multiple correlation of 1.00 between aggregate teacher characteristics and aggregate Teacher's Vocabulary Score, we would have accounted for approximately 42 percent of the total variance in this variable (see Vocabulary Score for K-6 teachers in table 10.2.1). The remaining 58 percent would have to be accounted for by differences among teachers within schools, and by error.

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[1] The correction for the appropriate degrees of freedom here is a modification of the shrinkage formula for a multiple correlation (see Thorndike, 1949, p. 209). To use this formula each school is regarded as a dummy variable or pseudo variable where a student is assigned a one if he attends that school and zero otherwise. This results in one dummy variable for each school; the dependent variable is regressed against the dummy variables. The formula used is:

$$\hat{P}^2 = 1 - \frac{(N-1)(1-R^2)}{N-p}$$

where

$\hat{P}^2$ = the corrected squared multiple correlation

N = the number of students

n = the number of schools

$p = n-1$

R^2 = the ratio of the among-school variance (S_A^2) to the total variance (S^2T), so that $S_A^2/S^2_T = R^2$.

Table 10.2.1.—Percent of Total Variance for Different Teacher Variables That Is Associated With the Schools in Which Teachers Are Located

Variable title	Grade levels[1]	
	9-12	K-6
Age	12	26
Experience	14	27
Teaching Conditions	36	45
Localism of Background	26	29
Socio-Economic Background	15	22
Training	20	40
College Attended	23	27
Teaching-Related Activities	17	21
Preference for Student-Ability Level	13	18
Sex	10	15
Racial-Ethnic Group Membership	90	81
Percent White of Students at Teacher's Undergraduate Institution	84	82
Annual Teaching Salary	30	53
Percent White of Teacher's Students	69	76
Vocabulary Score	26	42
Number of Schools	780	2,372
Number of Teachers	24,008	30,345

[1] The percents of total variance are for teachers classified as to whether they teach grades kindergarten through 6th or grades 9 through 12. Percentages for teachers classifiable at other grade levels were not available. The percentages have been rounded to 2 places of decimals and the leading decimals omitted.

These percentages are best interpreted as showing the extent to which teachers similar with respect to the variable under consideration tend to be located in the same schools. We say this because if there were no association of teachers' attributes with the schools in which they are located, then the percentage of total variance associated with the schools would be near zero for that variable.

Inspection of table 10.2.1 shows that there are not many schools that have a greater proportion of female teachers than do other schools. The remaining percentages range from moderate to large. They are almost always larger for K-6 schools than for 9-12 schools. The chief exception is in the case of Teacher's Racial-Ethnic Group Membership and Percent of White Students at the Teacher's Undergraduate Institution. Moderate values are observed for such variables as Teacher's Age, Experience, Localism of Background, Socio-Economic Background, College Attended, Teaching-Related Activities, and Preference for Student Ability Level. Somewhat larger are those values for Teaching Conditions, Training, Salary, and Vocabulary. The largest values are for Teacher's Racial-Ethnic Group Membership, Percent White of Students at Teacher's Undergraduate Institution and Percent White of Students in Teacher's Class. These large values show the tremendous racial imbalance that exists in our public schools.

10.2.2. Zero-Order Correlations for Selected Teacher Variables

The tables that follow give correlations for selected aggregate teacher variables. These variables were shown to be related to school outcomes both before and after schools had been equated for differences in size and in the social background of their students. Many of these same variables were also shown to be related to school outcomes in combination with other sets of variables (see chapters 5, 7, and 8). Table 10.2.2 summarizes a number of important basic relationships, and provides some insights into the results of the commonality and regression analyses given in the next section (these correlations are also given in appendix VIII). In order to reduce the amount of discussion, correlations of less than 0.10 will not be discussed.[2]

When teachers who have high scores on the vocabulary test are compared with low-scoring teachers we note that they:

(i) Come from the higher socioeconomic strata (Socio-Economic Background);

(ii) Are more likely to have not only an advanced degree, but accreditation (Training) and a higher salary level (Training and Salary);

(iii) Are more likely to have attended a college that offered an advanced degree and that they thought had a high academic standing (College Attended);

[2] A detailed discussion of these variables was given in chapter 3.

Table 10.2.2—Zero-Order Correlations of Selected Teacher Variables for Secondary (S) and Elementary (E) Teachers

Variable title[1]	Vocabulary score		Racial-ethnic group membership		College attended		Percent white undergraduate		Annual teaching salary		Teaching conditions		Preference for student-ability level		Percent white of teachers students	
	S	E	S	E	S	E	S	E	S	E	S	E	S	E	S	E
Experience	00	−07	−03	−02	−03	−16	01	02	48	31	02	06	−08	−08	−05	−01
Teaching Conditions	07	09	17	22	06	03	16	19	00	02			09	10	27	38
Localism	04	06	02	05	05	09	03	05	00	08	−01	00	01	01	04	04
Socio-Economic Background	18	20	12	16	14	19	11	13	−03	02	07	06	16	15	07	09
Training	10	12	07	01	08	07	08	01	81	79	00	03	02	04	−01	−04
College Attended	15	19	19	19			15	16	11	08	06	03	09	12	10	10
Teaching-Related Activities	−05	−13	−15	−18	01	−02	−17	−18	03	02	01	−01	−05	−10	−11	−13
Preference for Student-Ability Level	22	16	12	16	09	12	11	15	00	03	09	10			10	16
Sex	12	03	−06	00	01	−03	−05	−01	−17	−09	05	07	01	−02	−05	00
Age	04	−01	00	04	−02	−12	05	08	41	27	−01	06	−08	−08	−03	04
Racial-Ethnic Group Membership	31	40			19	19	77	81	13	08	17	22	12	16	60	64
Percent White at Undergraduate Institution	29	36	77	81	15	16			13	08	16	19	11	15	59	60
Credits Beyond Highest Degree	13	05	02	−02	08	07	03	−01	39	34	−05	−05	04	−01	−06	−07
Assignment to Present School	−01	02	13	12	02	01	11	11	−03	−04	06	05	−02	01	14	09
Salary	12	16	13	08	11	08	13	08			00	02	00	03	00	−02
Percent White of Teachers Students	20	28	60	64	11	10	59	60	00	−02	27	38	11	16		
Hours/Day Spent in Classroom Teaching	07	10	04	08	03	04	01	06	−02	14	03	−01	06	02	01	01
Vocabulary Score			31	40	15	19	29	36	12	16	07	09	22	16	20	28

[1] The correlations for Secondary Teachers (*S*) are based upon 24,008 teachers who could be classified as teaching grades 9–12. For Elementary Teachers (*E*) the correlations are based upon 36,241 teachers who could be classified as teaching grades kindergarten through 8. All figures have been rounded to 2 places of decimals and the leading decimals have been omitted.

(iv) Prefer to work with high-ability students (Preference for Student-Ability Level);

(v) Are more likely to be white, to have attended a predominantly white undergraduate institution, and to have predominantly white students in their class.

White teachers, when compared with nonwhite teachers:

(i) Enjoy more favorable Teaching Conditions; viz, they feel that the students try hard to achieve and that there is a relative absence of school problems;

(ii) Attended a higher ranking college (College Attended);

(iii) Are less involved in teaching-related activities;

(iv) Prefer to work with high-ability students;

(v) Are much more likely to have gone to a predominantly white undergraduate institution;

(vi) Are more likely to have chosen their present schools than to have been assigned to it;

(vii) Have a greater proportion of white students;

(viii) Attained higher scores on the Vocabulary test.

Teachers who attended an undergraduate institution that offered an advanced degree, and one that they felt had a high academic standing, were compared with teachers who attended institutions that ranked lower on these items. It was found that the teachers who attended the higher ranking institutions:

(i) Come from the higher socioeconomic strata;

(ii) Are more likely to be white and to have attended an undergraduate institution with a high proportion of white students;

(iii) Have a higher proportion of white students;

(iv) Attained higher scores on the Vocabulary test.

Both Percent of White Students at Teacher's Undergraduate Institution and Percent White of Teacher's Students are highly correlated with Teacher's Racial-Ethnic Group Membership. The correlations for the secondary and elementary levels are, respectively, 0.77 and 0.81 for Percent of White Students at Teacher's Undergraduate Institution, and 0.59 and 0.60 for Percent White of Teacher's Students. The comments that were made for Teacher's Racial-Ethnic Group Membership also apply to these other two variables. Consequently, they will not be discussed further.

Teachers with high salaries tend to:

(i) Have more experience;

(ii) Have more training (an index to which Salary is a major contributor);

(iii) Be older;

(iv) Have more credits beyond their highest degree;

(v) Have higher vocabulary test scores than their lower salaried counterparts.

Teachers who enjoy favorable Teaching Conditions (viz, they say that the students try hard to achieve, that there is a relative absence of school problems, etc.), when compared with teachers who say they have less favorable Teaching Conditions, are more likely:

(i) To be white;

(ii) To have attended a predominantly white undergraduate institution;

(iii) To have predominantly white students.

Teachers who express Preference For Working With High-Ability Students are more likely:

(i) To come from the higher socioeconomic strata (Socio-Economic Background);

(ii) To be white and to have attended predominantly white undergraduate institutions;

(iii) To have a higher percent of white students;

(iv) To have attained higher Vocabulary test scores.

These correlations show that Teacher's Vocabulary, Racial-Ethnic Group Membership, and experience in racially imbalanced situations relate to most of the other teacher variables. The next section presents the results of regression and commonality analyses that were conducted to illuminate the independent and common roles played by some of these variables in the preparation of teachers.

10.2.3. Commonality Analyses of Teacher Background Variables

The teacher's score on the vocabulary test, when treated as an aggregate school variable, was shown to be related to school outcomes. It was also shown to be moderately correlated with a large number of other teacher variables when the individual teacher was used as the unit of analysis. If we can regard this score as a true indicator of the teacher's verbal facility, then it is of interest to see how other variables reflecting different stages of the teacher's career are related to it. In order to conduct such an analysis, three different career stages were distinguished: Teacher's Background (B), Characteristics of Schools Attended (C), and (later or current) Teaching Situation (S). The variables comprising each set are as follows:

B: TEACHER'S BACKGROUND
- (1) Socio-Economic Background
- (2) Age
- (3) Sex
- (4) Racial-Ethnic Group Membership

C: CHARACTERISTICS OF SCHOOLS ATTENDED
- (1) Localism (i.e., attended local schools versus schools in another county or State)
- (2) College Attended
- (3) Percent of White Students at Teacher's Undergraduate Institution

S: TEACHING SITUATION
- (1) Teaching Conditions
- (2) Training (i.e., accreditation, salary, and highest degree held)
- (3) Teaching-Related Activities
- (4) Preference for Student-Ability Level

(5) Credits Beyond Highest Degree
(6) Assignment to Present School
(7) Hours Per Day Spent in Teaching
(8) Percent White of Teacher's Students

Three different kinds of analyses, presented in table 10.2.3.1., were conducted with these sets of variable:[3]

(1) All the variables in *B*, *C*, and *S* were used.

(2) All the variables were used with the exception of Racial-Ethnic Group Membership in *B*, Percent of White Students at Teacher's Undergraduate Institution in C, and Percent White of Teacher's Students in *S*.

(3) The *only* variables used were the racial-ethnic related ones; viz, the ones excluded from (2).

Inspection of table 10.2.3.1 shows that according to the first analysis the largest unique portions, for both elementary and secondary teachers, are for *B* and *S*. The unique values for *C* range from negligible for secondary teachers, to small for elementary teachers. The second-order commonality is appreciable—appreciable, that is, relative to the magnitude of the other variables—for *B* and *C*, and so is the third-order commonality. This indicates a common role[4] for all three sets.

In the second analysis, with the racial-ethnic related variables excluded, the higher order commonalities vanish. The only values that remain are the unique associations for each set, and these, as in the first analysis, are largest for *B* and *S* and lowest for *C*.

Clearly, the racial-ethnic related variables are the ones contributing most to the predictability of these sets of variables. The third analysis was conducted to demonstrate this predictability. Here, the unique portions for *C* and *S* vanish, while the unique portion for *B* retains a slight value. Most of the predictable variance is contained in the second-order commonality of *B* and *C*, and in the third-order commonality for *B*, *C*, and *S*.

Analyses (1), (2), and (3) have shown that, insofar as Teacher's Vocabulary Score can be regarded as a stable attribute of the teacher, the sets of variables that play the largest roles in the prediction of this attribute are *B* and *C*. It is clear, however, that *C* has a large common role in prediction but a very small independent one. The aspects of *B* and *C* that play the largest roles are Teacher's Racial-Ethnic Group Membership and Percent of White Students at the Teacher's Undergraduate Institution. This latter variable has a large common role not only with Teacher's Racial-Ethnic Group Membership but with Percent White of Teacher's Students, which is part of *S*.

When we compare these results with the correlations in table 10.2.2, we see that the teaching profession has a caste-like structure based on color. We can also infer how that caste perpetuates itself. The process, it may be suggested, is somewhat as follows. Nonwhites are more likely to be born into strata of society that afford comparatively few opportunities, through family or school, for the development of a "good" English vocabulary. The same applies to various ethnic groups. Thus, for Negroes, Mexican-Americans, Indian-Americans, Puerto Ricans, Oriental-Americans, and native Alaskans, either English may be a second language or the English used in the home may be incorrect by school standards. In addition, members of these groups are more likely to attend schools where they are in a majority. Such schools, as we have seen in previous chapters, offer education of a significantly lower quality, and are less oriented toward achievement or the motivation of achievement. Teachers from this kind of background are then placed in charge of students who share it with them. Naturally, the effects of the background, including poor command of English, are then reinforced.

The remaining analyses in this chapter attempt to uncover the role played by College Attended and Percent White of Teacher's Undergraduate Institution in predicting Vocabulary Score, Teacher's Preference for High-Ability Students, and Teacher's Salary. Teacher's Racial-

Table 10.2.3.1.—Squared Multiple Correlations[1] for B, C, and S With Vocabulary Score, Expressed as a Function of Their Unique Association and Their Commonality Coefficients, When Racial-Ethnic Background and Racial Balance Measures Are Included and Excluded

Commonality coefficients[2]	Sets of regressor variables								
	Elementary vocabulary			Elementary vocabulary			Elementary vocabulary		
	B_1	C_1	S_1	B_2	C_2	S_2	B_3	C_3	S_3
First order:									
U(B)	03			02			03		
U(C)		01			02				
U(S)			02			05			
Second order:									
C(BC)	05	05		01	01		06	06	
C(BS)	01		01	01		01	01		
C(CS)					01	01			
Third order:									
C(BSC)	08	08	08				07	07	07
R^2 for a single set of variables	18	15	12	04	04	07	16	13	08
	Secondary vocabulary			Secondary vocabulary			Secondary vocabulary		
	B_1	C_1	S_1	B_2	C_2	S_2	B_3	C_3	S_3
First order:									
U(B)	04			03			02		
U(C)		01			01			01	
U(S)			05			06			
Second order:									
C(BC)	04	04					04	04	
C(BS)	01		01	01		01			
C(CS)					01	01			
Third order:									
C(BSC)	05	05	05				04	04	04
R^2 for a single set of variables	13	10	11	04	02	08	10	08	04

[1] Rounded to 2 places of decimals after computation, leading decimals and zeroes omitted.

[2] *B* designates Teacher Background; *C*, Area of Schooling and College Attended; *S*, Teaching Situation. The subscripts refer to the composition of the different sets of variables. Thus, 1 designates the full set; 2 designates the sets with Teacher's Racial-Ethnic Group Membership excluded from *B*, Percent White at Undergraduate excluded from *C*, and Percent White of Teacher's Students excluded from *S*; 3 designates that these latter 3 variables only were used. There were 24,008 Secondary and 36,241 Elementary teachers included in those analyses. The squared multiple correlation when all 3 sets are entered into the regression are for Elementary and Secondary, respectively: First Analysis (1), 22, 19; Second Analysis (2), 12, 12; Third Analysis (3), 16, 10.

[3] The subscripts 1, 2, and 3 on the sets of regressor variables in table 10.2.3.1 correspond to the 1st, 2d, and 3d analyses described in the text.

[4] The terms independent and common role are used as they were defined in the previous section.

Ethnic Group Membership was also included in the analyses in order to give an indication of the role played by the teacher's background. Finally, since it was expected that the older, more experienced teachers would have higher salaries, we decided to include Teacher's Age. These analyses are given in table 10.2.3.2. A high score on each variable indicates an older, white teacher who attended a predominantly white college that offered an advanced degree and had a high academic standing.

Inspection of table 10.2.3.2 shows that, in predicting Vocabulary Score, there are slight unique portions for Teacher's Racial-Ethnic Group Membership and College Attended, and near-zero values for Age and for Percent of White Students at Teacher's Undergraduate Institution. Most of the predictable variance is contained in the second-order commonality of Teacher's Racial-Ethnic Group Membership and Percent of White Students at Teacher's Undergraduate Institution, and in the third-order commonality of these two variables with College Attended.

What do these results mean? At the very least, they suggest that College Attended, with all that this implies (see p. 88), has a very slight independent role in the development of Vocabulary Score. It has a slightly greater common role with Teacher's Racial-Ethnic Group Membership and with Percent of White Students at Teacher's Undergraduate Institution. The largest role, however, is played by Teacher's Racial-Ethnic Group Membership, both independently and in common with the Percent of White Students at Teacher's Undergraduate Institution.

The analysis also shows that almost all of the differentials in salary levels among teachers can be accounted for by differences in age and experience. At the secondary level only a slight independent role is played by College Attended. All the higher order commonalities are so small they approach vanishing point. It is true, however, that College Attended has a slight independent role at the elementary level, where it helps to predict Preference for High-Ability Students. At the same level, a small common role is played by Teacher's Racial-Ethnic Group Membership and by Percent White at Undergraduate Institution. But for secondary teachers these trends do not hold up.

The remaining commonalities are negligible. Neither the racial composition of the college attended nor the teacher's racial-ethnic background appear to play much of a direct role in the development of a preference for working with students of a particular ability level. Rather, it is the teachers who score high on the vocabulary test who prefer to work with high-ability students (see the correlations in table 10.2.2). Since, as we have seen, the racial composition of the school and the racial-ethnic background of the teacher may help to determine Teacher's Vocabulary Score, these same variables may also play indirect or cooperative roles with Vocabulary Score in predicting Preference for High-Ability Students. This assumes, of course, that Vocabulary Score is entered explicitly into the analysis.

Table 10.2.3.2.—Squared Multiple Correlations [1] for R, C, W, and A, Expressed as a Function of Their Unique Association and Commonality Coefficients for Teacher's Vocabulary, Salary, and Preference for High-Ability Students

Commonality coefficients [2]	Sets of regressor variables											
	Elementary vocabulary score				Secondary vocabulary score				Elementary salary			
	R	C	W	A	R	C	W	A	R	C	W	A
First order:												
U(R)	03				02							
U(C)						01						
U(W)			01				01					
U(A)												07
Second order:												
C(RC)												
C(RW)	11		11		07		07					
C(RA)												
C(CW)												
C(CA)												
C(WA)												
Third order:												
C(RCW)	02	02	02		01	01	01					
C(RCA)												
C(RWA)												
C(CWA)												
Fourth order: C(RCWA)												
R^2 for a single set	16	03	13		10	02	08		01	01	01	07

Commonality coefficients [2]	Secondary salary				Elementary preference for student ability				Secondary preference for student ability			
	R	C	W	A	R	C	W	A	R	C	W	A
First order:												
U(R)												
U(C)		01				01						
U(W)												
U(A)				17			01					01
Second order:												
C(RC)												
C(RW)	01		01		02		02		01		01	
C(RA)												
C(CW)												
C(CA)												
C(WA)												
Third order:												
C(RCW)					01	01	01					
C(RCA)												
C(RWA)												
C(CWA)												
Fourth order: C(RCWA)												
R^2 for a single set	02	01	02	17	03	01	02	01	02	01	01	01

[1] Rounded to 2 places of decimals after computation, leading decimals and zeroes omitted.

[2] *R* designates the Teacher's Racial-Ethnic Group Membership; *C*, College Attended; *W*, Percent of White Students at the Teacher's Undergraduate Institution; *A*, Teacher's Age. The squared multiple correlations obtained when all 4 variables are entered into the regression for Elementary and Secondary, respectively, are: Vocabulary, 18, 11; Salary, 08, 20; Preference for Student Ability Level, 05, 03. There were 36,241 Elementary and 24,008 Secondary teachers included in these analyses.

10.2.4. Possible Causal Inferences

In this section variables that had been shown to be related to school outcomes as aggregate variables have been studied for individual teachers. We have given the percent of variance in different teacher variables that is associated with the schools in which they are located. We found that the variables most highly associated with school differences were those that pertained to conditions of racial and ethnic imbalance (see p. 88). Still other variables that had moderate-to-high associations with school differences were Teacher's Annual Teaching Sal-

ary, Teacher's Vocabulary Score, and the teacher's view of his teaching situation (see p. 88).

With the individual teacher as the unit of analysis, correlations among the teacher variables were computed and compared. The variables most frequently correlated with other teacher variables were Teacher's Racial-Ethnic Group Membership, Percent of White Students at the Teacher's Undergraduate Institution (with other experience in racially imbalanced situations), and Teacher's Score on Vocabulary Test.

Commonality and regression analyses were conducted to illuminate the independent and common roles played by some of these variables in the preparation of teachers. Since the Vocabulary score was shown to be related to a number of school outcomes as an aggregate variable, an analysis was made of the relative roles of variables that could be classified into one of three stages in the career development of a teacher. The three stages were Teacher's Background (*B*), Characteristics of Schools Attended (*C*), and Teaching Situation (*S*). Variables related to Racial-Ethnic Group Membership of teachers, Percent of White Students at Teacher's Undergraduate Institution, and Percent White of Teacher's Students were both included in and excluded from the analyses in order to show what influence they had in the prediction of Vocabulary Score. The analysis showed that the racial-ethnic variables not only had the greatest influence but were giving rise to the common roles of *B*, *C*, and *S*. When these three sets of variables were analyzed separately it was found that Teacher's Racial-Ethnic Group Membership had the largest independent role, as well as a large cooperative role with Percent White of Undergraduate Institution and Percent White of Teacher's Students. These results were interpreted as indicating that, as the educational experiences of white and nonwhite or ethnic teachers are presently constituted, the racial composition of the undergraduate institution does not have an independent influence on Vocabulary Score. It may, however, exert a cooperative influence in conjunction with other racial-ethnic related variables.

One possible reason why the racial composition of the undergraduate institution does not wield more of an independent influence is that the vast majority of nonwhite or ethnic teachers have in the past attended segregated educational institutions. In other words, so little integration has occurred that its independent influence has not become evident. Indeed, the large correlations that exist between Teacher's Racial-Ethnic Group Membership, Percent of White Students at Teacher's Undergraduate Institution, and Percent White of Students in Teacher's Class indicate the existence of a strong color-caste system in the teaching profession. What this system amounts to is that nonwhite students attend predominantly nonwhite educational institutions, from which some emerge as teachers who then teach predominantly nonwhite students. Thus, the system is not only self-perpetuating but self-reinforcing. Its principal mechanism of self-reinforcement is the perpetuation of differential verbal skills. Nonwhites and members of ethnic groups tend to be born into the lower strata of society, where there are fewer opportunities to develop English-language skills. They also tend to be enrolled in segregated educational institutions, with all that this implies for lower achievement motivation and poorer educational quality. An additional result of segregation is that teachers from a nonwhite or ethnic background tend to pass on the disadvantages of that background to their students.

The other analyses were designed to show the roles of Teacher's Racial-Ethnic Group Membership, College Attended, Percent White at Undergraduate Institution, and Age in the development of Vocabulary Score, Salary Level, and Preference for Working with High-Ability Students. It was found that although the nature of the college attended has a slight independent role, as well as a common role with the teacher's racial-ethnic background and with the racial composition of the teacher's undergraduate institution, the largest contributions were made by the *common* roles of the teacher's racial-ethnic background and the school's racial composition. Most of the salary differentials could be accounted for by age and experience differences among teachers. None of these four variables played much of an independent or common role in Preference For Student-Ability Level, whether the preference was for students of low or high ability.

It was further observed that teachers who scored high on the vocabulary test expressed a preference for working with high-ability students. It had already been shown that the teacher's racial-ethnic background and college attended (including its racial composition) did play roles in the development of Vocabulary Score. It was therefore suggested that these variables might have an indirect influence on the development of Preference for Student-Ability Level.

SUMMARY

Previous chapters suggested that a large role in influencing school outcomes is played by School Personnel and Personnel Expenditures, particularly in conjunction with the student body background variables of Socio-Economic Status, Family Structure, and Racial-Ethnic Composition (see especially chapters 5 and 8). This chapter attempted to pinpoint the *kinds* of school personnel variables that play a role in school outcomes. In order to do this, the set of school personnel variables was broadened to include more of the related variables. It was then broken down into three subsets (see p. 81). The set of student body background variables was also included in the analysis to show its common role with these other sets of variables.

The outcome variables were: Students' Expectations for Excellence, Attitude Toward Life, Educational Plans and Desires, and Study Habits and Achievement. At the 12th grade there were also various special measures, such as Percent of Graduates Going on to College. The results suggested that increases in personnel expenditure *might* result in improvements in school outcomes, but that they would be small ones (pp. 85–86). In the

absence of properly designed educational experiments, we can only guess at the possible effects of *really* large increases in such expenditure.

The other three sets of variables (pp. 85–86), with Student Body Social Background, were found to have large independent and common roles in school outcomes. In particular, the following variables, in conjunction with Student Body Social Background, appeared to be influential: Teaching Conditions (based on the teacher's view, it should be remembered); Teacher's Racial-Ethnic Group Membership; Teacher's Vocabulary Score; Percent of White Students at Teacher's Undergraduate Institution; Percent White of Students in Teacher's Class.

It was suggested that by reducing the dependence of schools on the social background of the students and school personnel (that is, by achieving a greater socioeconomic and racial balance among both students and staff) that educational factors such as the teacher's training and the school's physical facilities might then have a greater chance to influence school outcomes.

Finally, we investigated various aspects of the individual teacher's background and training. We discovered that teacher preparation and performance are dominated by a color-caste system that, in all likelihood, is self-perpetuating. One effect of this system, it was suggested, is to reinforce differential verbal skills along racial and ethnic lines. The resultant distribution of verbal skills then plays a role in other variables, especially the teacher's preference for working with students of different ability levels.

11. Technical Summary and Recommendations for Future Research

11.1. OBJECTIVES AND METHODOLOGY

The general objective of this study was to find which characteristics of schools were related to school outcomes, and to suggest which ones might be most important in influencing these outcomes. The study used data from the Educational Opportunities Survey. This survey covered about 650,000 students in some 4,000 public schools throughout the country, together with their teachers, principals and superintendents. The grades selected for study were one, three, six, nine, and 12, and the survey sample consisted of a 5-percent sample of schools.

The data base is comprehensive in the sense that detailed factual and attitudinal information was collected on the student's home background, attitude toward school, race relations, and the world. A battery of ability and achievement tests was administered at each grade level. Information was collected from the teachers and principals concerning their training and experience, their view of the school, etc. The final part of the teacher questionaire consisted of a 30-item contextual vocabulary test (p. 5). Principals also answered questions on the school's facilities, staff, programs, curriculums, etc.

The same data base had already been used in the preparation of *Equality of Educational Opportunity*, a report presented to the Congress (Coleman et al., 1966). More detailed information on the data base can be obtained both from this earlier report and from chapter 2 of the present report.

11.2. ITEM ANALYSIS, DATA REDUCTION, AND INDEX DEVELOPMENT

One of the main problems in this study was to reduce its more than 400 variables to a much smaller number of indices and sets of indices. The purpose of this was twofold: to simplify data processing, and to group items on the basis of similar content and degree of correlation. In this way it was hoped that results of later analyses would be more sharply defined. For example, by grouping data on instructional facilities (number of school's language and reading labs, number of books in the school library, etc.) into a single index, we expected to obtain a clearer picture of how far instructional facilities as such contribute to school outcomes.

Before the variables could be reduced to meaningful groupings, two major decisions had to be made. The first concerned the estimation of data missing because of nonresponses. The procedure adopted was as follows. The responses to each question were analyzed against one or more dependent variables. In this way not only the percent responding to each item but also their mean score on the dependent variable could be used as a guide in coding the variables and in assigning a value to the nonrespondents. Items from the Student questionnaire were analyzed against an Achievement composite that was developed from the five Achievement measures of Verbal Ability, Nonverbal Ability, General Information, Math Achievement, and Reading Comprehension. Items from the Teacher's questionnaire were analyzed against the number of items correct on the Contextual Vocabulary test. The Principal's questionnaire items were analyzed against the school's size (the number of students enrolled), Rural-Urban Location, Parent's Socio-Economic Status, and Principal's Salary.

As a result of these analyses, it was possible to code the items from each questionnaire and then correlate them with one another. The intercorrelations were then subjected to a series of factor analyses. The particular factor analytic techniques used were Principal Component Analyses and Varimax rotations of these components (viz, the components with a latent root of one or greater were rotated). The guiding philosophy in this phase was to obtain meaningful groupings of variables—i.e., groupings that had some empirical basis inasmuch as they were correlated with one another. The details of the procedural steps employed as well as the variables

comprising each of the indices developed are given in chapter 3. The descriptive labels for each index are:

Students
Expectations for Excellence [1]
Socio-Economic Status
Attitude Toward Life [1]
Family Structure and Stability
Educational Desires and Plans [1]
Study Habits [1]
Classroom Behavior [2]
Achievement

Teachers
Experience
Teaching Conditions
Localism of Background
Socio-Economic Background
Training
College Attended
Teaching-Related Activities
Preference for Student-Ability Level

Principals and Schools
Physical Plant and Facilities
Principal's Experience
Principal's Training
Principal's College Attended
Frequency of Testing
Pupil Transfers
Remedial Programs
Free Milk and Lunch Programs
Instructional Facilities
Specialized Staff and Services
Tracking and Ability Grouping
Accreditation
Age of Texts
Availability of Texts

Of the variables excluded from these indices, some were retained for separate analysis. Among these were Racial-Ethnic Group Membership (both student's and teacher's), Number of Pupils Per Teacher, and Number of Pupils Per Room. Others, such as teacher's membership in Phi Beta Kappa or similar association, did not enter meaningfully into any of these indices, but were analyzed at a later stage.

11.3. PERCENT OF TOTAL VARIANCE ASSOCIATED WITH SCHOOLS ATTENDED

Index scores were computed for the students at each grade level and then averaged by school. The averages were used in later analyses. For some variables, such as Achievement and Socio-Economic Status, we were interested in finding out to what extent students who were similar with regard to a given attribute were aggregated into the same schools. We expected this to tell us how far differences with regard to the attribute could be explained by studying differences among or between schools. For example, if it is known that 50 percent of the variance in a certain attribute is associated with the schools students attend, then the maximum amount of variance that can be explained by studying school correlates of the attribute is 50 percent. In other words, if we were to obtain a multiple correlation of 1.00 between a set of school aggregate variables and this attribute, we would still have explained only 50 percent of the total variance.

In our analysis of selected attributes, the total variance found to be associated with the schools students attend ranged within the following percentage limits:

Attribute of Interest:	*Percent of total variance associated with schools (range)*
Socio-Economic Status	28–39
Family Structure and Stability	12–24
Racial-Ethnic Group Membership	56–69
Expectations for Excellence	6–15
Attitude Toward Life	9–22
Educational Plans and Desires	9–12
Study Habits	11–19
Achievement	34–37

[1] Grades 3, 6, 9, and 12 only.
[2] Grade 1 only.

The much larger values for Racial-Ethnic Group Membership reflect the amount of racial segregation in the public schools. A detailed analysis of these values and their school correlates is given in chapter 4.

11.4. CONDITIONS SUPPORTING THE NOTION OF SCHOOL INFLUENCES

Before attempting to ascertain the influence of school variables on school outcomes, allowance must be made for the kinds of students the schools get initially. Clearly, if school *A* gets children mainly from families where intellectual activities are not valued or pursued, and school *B* gets children from families with the opposite attitude, then one would expect the students in school *B* to have higher achievement levels than the students in school *A*. But the differences between the schools in this respect would have to be attributed to the influence of the different families rather than to that of the schools.

For this reason, we equated schools for differences in the home background and racial-ethnic composition of their students before trying to assess the influence of school variables. Home background was represented by the student indices of Socio-Economic Status and Family Structure and Stability. Student's Racial-Ethnic Group Membership was used to calculate the racial and ethnic composition of the student body. These three variables are called Student Body Social Background variables or, in shorter form, the Student Body variables.

To represent the school a comprehensive set of 31 school variables was used. This set comprised the following three subsets:

Facilities: A subset of four variables referring to the size of the school's plant and physical facilities, its instructional facilities, age of school building, and number of pupils per room.

Pupil Programs and Policies: A subset of 10 variables referring to such practices as tracking, frequency of testing, remedial programs, free milk and lunch programs, pupil-teacher ratio, etc.

School Personnel and Personnel Expenditures: A subset of 17 variables referring to the principal's and teacher's experience, training, and college attended, the specialized staff and services that the school offers, the teacher's racial and ethnic group membership, vocabulary score, view of teaching situation, etc.

To represent school outcomes we used the student variables of Expectations for Excellence, Attitude Toward Life, Educational Plans and Desires, Study Habits, and Achievement. At the 12th grade we used five additional outcome measures: percent of graduates going on to college and percent going on to postsecondary vocational training, for both white and nonwhite; and percent of 10th grade students who drop out before completing the 12th grade.

If schools are having some influence on school outcomes, what kinds of relationships would we expect to find between these sets of variables? For one thing, the

achievement and attitudes of the students should become more predictable from the School variables the longer the students stay in school. For another, the Student Body variables should exhibit a progressive increase, from the lower to the higher grades, in their correlation with both the School variables and the School Outcomes. In addition, if the intercorrelations of the Outcomes increase with the higher grade levels, it would appear that the Outcomes are reinforcing each other. All these trends, if detected, would support our hypothesis that school influences are at work. But this evidence alone would not be conclusive. First, we would have to make allowance for trends that can be attributed to other variables. Only if the trends persisted after we had done this could we be certain that school influences were at work. We shall return to this point below.

One way of representing the degree of intercorrelation that exists among all of the variables in a set is to divide the root associated with the first principal component of these intercorrelations by the number of variables in the set. The value thus obtained indicates the extent to which the variables in the set are correlated with one another. If all the variables are perfectly correlated, this value will be 100, meaning that the common variance is 100 percent. As the correlations among the variables in the set approach zero, the percent of common variance will also approach zero.[3] Table 11.4.1 gives the percent of common variance for the Student Body (B), School (S), School subsets of Facilities (F), School Personnel (T), and Pupil Programs (P), as well as those for the five school outcomes that were common to grades three through 12.

We would not expect the intercorrelations of the Student Body variables (p. 42) to change much for the different grade levels. Ideally, their degree of correlation should remain relatively constant. The fluctuations observed for these variables in table 11.4.1 result partly from differences in data sources. At grades one and three the teacher provided much of the information on the students. At the higher grade levels, on the other hand, the student provided the information himself. Thus, the response errors and the failure-to-respond errors originate from different sources. Also, after the sixth grade students tend to be aggregated into junior and senior high schools that tend to be both larger and more heterogeneous from a social point of view. After the ninth grade, students start dropping out of school. Those who drop out are likely to be from the lower socioeconomic strata, to have a less well-knit family structure, and to be nonwhite. All of these factors can operate to perturb intercorrelations that would otherwise be more stable from one grade level to the next. Still, the fluctuations do not appear large enough to invalidate conclusions about school influences.

Similarly, one would not expect intercorrelations among School variables to change markedly over the grade levels. Table 11.4.1 shows that there is indeed a high degree of similarity in the percent of common variance for the full set of School variables, as well as for the subsets of Facilities, Pupil Programs and Personnel. The changes that do occur are, as might be expected, at the higher grade levels.

The percent of common variance for the Outcome measures shows a marked jump from the third to the sixth grade, followed by a slight decline at the ninth grade and a marked drop at the 12th grade (Outcome measures other than Achievement were not available at the first grade.) Part—perhaps even all—of the jump between third and sixth grade can be explained by the fact that the Outcome measures are not as well represented at the third grade. The sharp drop between the ninth and 12th grade reflects in large part the influence of the dropouts. Since they are usually the lower achieving and least motivated students, their loss from the sample of students at the 12th grade tends to reduce the magnitude of Outcome measure intercorrelations and consequently their common variance. As we shall see later, there may also be some very real changes in the Outcome intercorrelations for 12th-grade schools. Also, when the five additional 12th-grade measures were introduced into the analysis, the percent of common variance dropped to 28. These results suggest that there are influences that reduce the intercorrelation of the Outcome measures without reducing their mutually facilitative effect.

We have seen that the percent of common variance for the Student Body variables and for the School variables remains relatively constant in moving from one grade level to the next. We have also seen that the degree of intercorrelation among the Outcome measures decreases at the higher grade levels, even though it is possible that the outcomes themselves may continue to reinforce each other. It remains to be shown to what extent the correlations of the School variables and Student Body variables have with each other and with the Outcomes-measures increases at the higher grade levels.

The squared multiple correlations of the School variables with the school Outcomes are given in table 11.4.2.

Table 11.4.1—Percent of Common Variance for the Student Body, School, and School Outcome Sets of Variables

Set of variables	Percent of common variance at grade level				
	1	3	6	9	12
Student Body	70	72	76	79	71
School	14	14	14	15	15
School Facilities	37	37	37	35	36
School Pupil Programs	16	16	16	18	21
School Personnel	22	22	22	22	19
School Outcomes		54	76	71	47

[3] See chapter 3 for a fuller account of this technique.

Table 11.4.2.—Squared Multiple Correlations of the School Variables With the School Outcomes

School outcome	Squared multiple correlation of the school variables at grade level				
	1[1]	3	6	9	12
Expectations for Excellence		08	23	18	38
Attitude Toward Life		09	30	35	42
Educational Plans and Desires		14	33	32	42
Study Habits		36	28	20	16
Achievement	47	49	73	76	79

[1] Outcome measures other than Achievement were not available at the 1st grade.

Here we see that the predictability of the School Outcomes from the set of School variables increases at the higher grade levels for Attitude Toward Life, Educational Plans, and Desires and Achievement. An oscillating but increasing trend is observed for Expectations for Excellence, while a decreasing trend is observed for Study Habits. Thus, while not all of the School Outcomes become more predictable from the School variables as one ascends the grade levels, the trend is for *most* of the Outcome measures to become more predictable.

Table 11.4.3 gives the squared multiple correlation of the Student Body Background variables with the School Outcomes. There is an increase in the predictability of the School Outcomes from the three Student Body variables through the ninth grade. After that comes a moderate to sharp decrease in the predictability of all Outcome variables except that of Achievement, which remains high at the 12th grade. As will be seen later there may be some real changes, in addition to the influence of the dropouts, that might account for this sharp drop in predictability.

Table 11.4.3.—Squared Multiple Correlations of the Student Body Background Variables With the School Outcomes

School outcome	Squared multiple correlation of the student body variables at grade level				
	1[1]	3	6	9	12
Expectations for Excellence		24	46	52	20
Attitude Toward Life		22	57	58	48
Educational Plans and Desires		19	50	61	47
Study Habits		49	57	[illegible]	82
Achievement	43	52	79	8[illegible]	82

[1] Outcome measures other than Achievement were not available at the 1st grade.

Table 11.4.4 attempts to show in a slightly different way that the influence of the School variables is related to the nature of the student body. It also shows what aspects of the student body become progressively related to the School variables. As one ascends the grade levels the predictability of the Student Background variables from the School variables increases—but much more so for Socio-Economic Status than for any of the other measures. This suggests that the Socio-Economic Status (or Composition) of the students plays a greater role in school influences than do the other Student Body background variables.

Table 11.4.4.—Squared Multiple Correlations of the School Variables With the Student Body Background Variables

Student body variable	Squared multiple correlation of the school variables at grade level				
	1	3	6	9	12
Socio-Economic Status	53	61	64	67	74
Family Structure and Stability	44	31	45	42	49
Racial-Ethnic Composition	85	81	83	85	90

SUMMARY

We have seen that most of the School Outcome measures become increasingly more predictable from the comprehensive set of 31 school variables the longer the student stays in school. We have also seen that these increases are not readily attributable to changes in the composition or degree of intercorrelation of the School variables or to changes in the degree of intercorrelation of the Student Body variables. In addition, we have noted that the Student Body variables become ever more highly correlated with the School Outcomes and with the School variables at the higher grade levels. For the relationship between the School variables and the Student Body variables this increase is most pronounced for the Socio-Economic Status (or composition) of the students. Taken together, these trends support the notion that the schools are indeed having an influence on their students.

To be even more conclusive, we would have to show that certain relationships persist even after other influences have been eliminated. Ideally, we should have measurements on the very same students at these different time periods. We could then show that the schools have an influence that is independent of the students' prior experiences. On the basis of the observed trend whereby the Student Body variables become increasingly more correlated with both School Outcomes and School variables we may anticipate that there may be difficulties in equating for these prior experiences. The influence of the schools may in fact be bound up with the prior experiences of their students, especially with experiences related to their different social backgrounds.

11.5. SCHOOL INFLUENCES THAT ARE INDEPENDENT OF STUDENT BODY VARIABLES

Schools can be equated for differences in the family backgrounds of their students before being examined for influences on school outcomes. The reasoning behind this procedure is that some of the differences in school outcomes can be attributed to the influence of the different family backgrounds rather than to the influence of the schools. In our analysis, the Student Body variables (B) were used to represent student body influences, and a comprehensive set of 31 School variables (S) to represent school influences. The following equation shows how far the influence of the School variables on Outcomes is independent of the Student Body variables:

$$(1) \quad U(S) = R^2(B, S) - R^2(B)$$

$U(S)$ is the portion of the squared multiple correlation that can be uniquely associated with S when it is entered into the analysis with B. It is obtained by subtracting the squared multiple correlation of B, $R^2(B)$, from the squared multiple correlation obtained for both sets of variables, $R^2(B, S)$. A second equation enables one to obtain the unique portions for B in a similar manner:

$$(2) \quad U(B) = R^2(B, S) - R^2(S)$$

$R^2(S)$ is the squared multiple correlation obtained for S, and $R^2(B, S)$ is the squared multiple correlation obtained when both sets of variables are entered into the analysis.

These unique values, as well as the squared multiple correlation for both sets of variables, are given in the upper half of table 11.5.1 for the Outcome measures that

Table 11.5.1—Proportion of Variation in School-Outcome Measures Attributable to B and S

Grade level[1]	Outcome measures: Expectations			Attitude to life			Educational plans			Study habits			Achievement		
	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)
12th	25	06	44	07	14	56	15	19	61	14	40	56	04	08	86
9th	11	45	63	05	29	64	06	35	67	04	58	78	05	11	87
6th	03	26	49	02	29	58	02	19	52	02	31	60	04	10	83
3d	03	19	26	06	18	27	03	07	22	04	17	53	04	07	56
1st													09	05	52
	Percent to college			Percent nonwhite to college			Percent to vocational			Percent nonwhite to vocational			Percent boy dropouts		
	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)	U(S)	U(B)	R²(B, S)
12th	19	06	57	18	02	23	25	01	27	20	02	24	24	02	34

[1] $U(S)$ and $U(B)$ are the unique portions for the School and Student Body (B) variables, respectively. $R^2(B, S)$ is the squared multiple correlation obtained when both sets are entered into the analysis.

are common to the different grade levels. In the lower half will be found the same values for the 12th-grade Outcome measures.

Table 11.5.1 shows that the $U(S)$ values are small in comparison with the $U(B)$ values for Expectations, Attitude Toward Life, Educational Plans, and Study Habits. The same trend appears in the much smaller $U(B)$ values for Achievement. For the special 12th-grade measures, however, the unique portion for S variables greatly exceeds that for B. Even more important, the unique values for B and S are small compared with the squared multiple correlation when both B and S are entered into the regression analysis. This indicates that there is considerable overlap between these two sets of variables in predicting all of the Outcome measures common to the different grade levels. The same holds good for two out of five of the Outcome measures specific to the 12th grade. For these Outcomes, it appears, the influence of the schools may be bound up with the social background of the students or at any rate their background as we have defined it. A technique that allows one to express this degree of overlap is given in the next section.

11.6. COMMONALITY ANALYSIS: ITS MEANING AND APPLICATION

To express the degree of correlation, overlap or confounding that exists between two sets of variables in predicting a dependent variable we need a *coefficient of commonality*. Let the coefficient of commonality for sets B and S be $C(BS)$. Then, following equations 1 and 2 in section 11.5:

$$(3) \quad C(BS) = R^2(B, S) - U(B) - U(S)$$

This coefficient represents the proportion of variation in the dependent variable that cannot be apportioned to one of the sets and hence is common to the two sets of variables.[4] This technique for partitioning the variance allows one to express the proportion of variation in a dependent variable that is attributable to one set of variables as the sum of its commonality coefficient and its unique association. Thus:

$$(4) \quad R^2(S) = C(BS) + U(S)$$

$$(5) \quad R^2(B) = C(BS) + U(B)$$

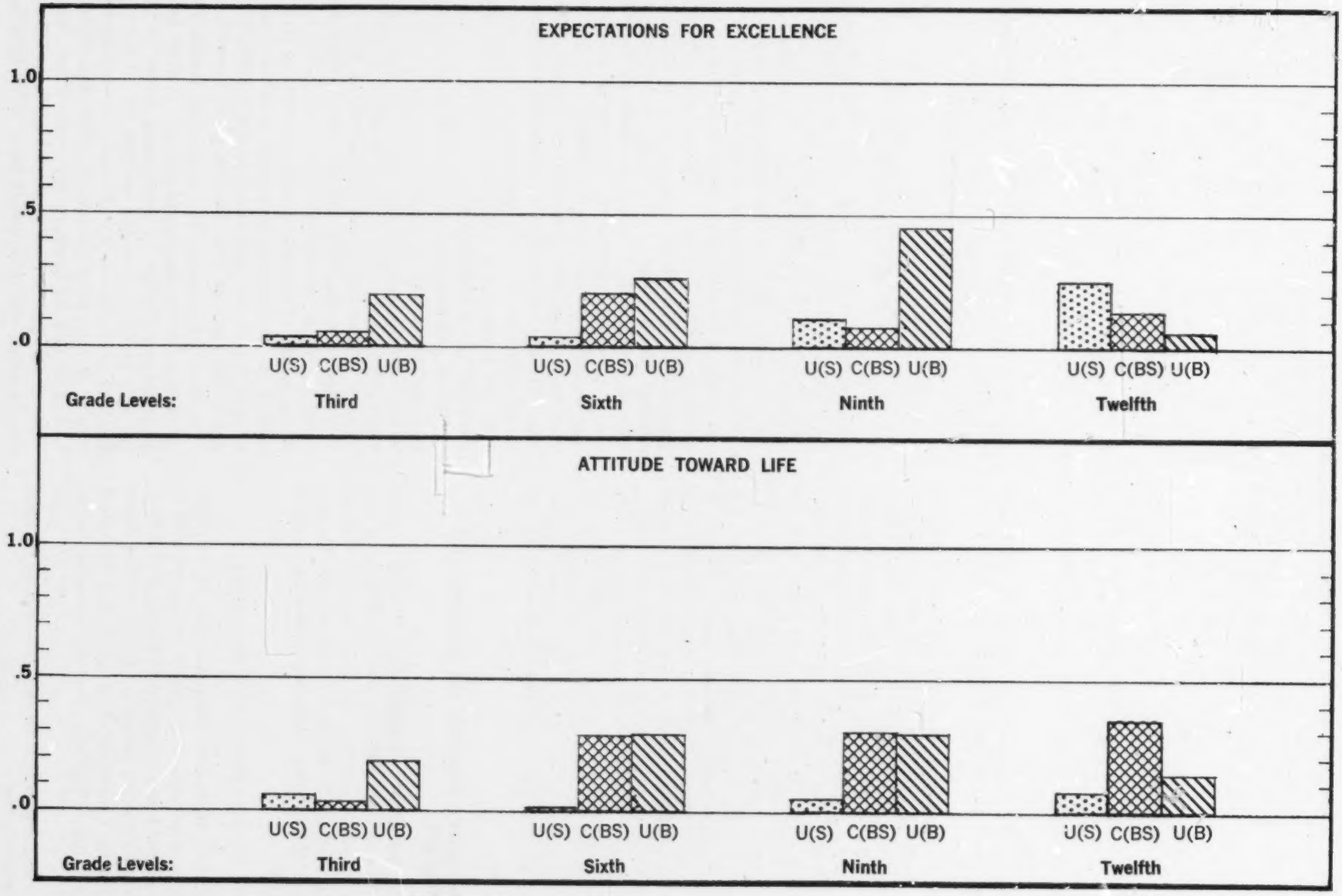
The pages that follow give a graphical presentation of the $U(S)$, $U(B)$ and $C(BS)$ values for the different Outcome measures at the different grade levels (the tabular material for these analyses is given in chapter 5). It is assumed that S and B wield independent influences proportional to the magnitude of their unique values, and may wield additional influences in proportion to the magnitude of $C(BS)$. The terms "independent role" and "independent contribution" denote the independent influences just referred to. The terms "common role" and "common contribution" refer to situations in which we cannot tell to what extent the variance should be attributed to one of the sets, nor the extent to which this variance may represent a cooperative influence of the two sets. This is not to say that all of the relationships reflect causal influences, but only that some of them do. Moreover, the absence of a relationship tends to preclude the possibility of a causal influence.

Figures 11.6.1 through 11.6.3 depict grade-level trends for Outcome measures common to the different grade levels. Figure 11.6.4 presents results for outcome measures specific to the 12th grade. The height of each bar in these charts represents the magnitude of the commonality coefficient. Since the unique values and commonality coefficient at each grade level sum to R^2 (B, S), increases in the height of the bars represent increases in the proportion of an Outcome measure's variation that is accounted for. It will be noted that the relative roles of S and B often change with different grade levels.

Figure 11.6.1 shows the grade-level trends for Expectations for Excellence and Attitude Toward Life. For Expectations, B plays an increasingly large role through the 12th grade, as does the common role of S and B. At the 12th grade, however, a dramatic reversal occurs: the role of B is greatly diminished, while the independent role of S and its common role with B are increased. Some of this can perhaps be attributed to the influence of the dropouts, who presumably have lower Expectations.

[4] A mathematical exposition of this technique is given in appendix II, under separate cover.

Figure 11.6.1.—Graphical Representation of the Common and Unique Roles Played by the School and Student Body Variables in the Development of Expectations and Attitude Toward Life



U(S) Unique or independent role of the School.
U(B) Unique or independent role of the Student Body Social Background.
C(BS) Common role of the Student Body Social Background and School.

Analyses in chapter 4, 5, and 6 showed that some of it may also be due to increases in the Expectations of students in predominantly nonwhite schools. For Attitude Toward Life the independent role of *B* increases through the ninth grade and then diminishes somewhat at the 12th grade. Again, some of this change at the 12th grade may be due to the influence of the dropouts. It should be noted, however, that the common role of *S* and *B* does show a progressive increase from the lowest to the highest grades.

Figure 11.6.2 shows the grade-level trends for Educational Desires and Plans, and for Study Habits. An ever greater common role in Educational Plans is played by *S* and *B* at the higher grade levels, while the independent role of *B* increases through the ninth grade and then diminishes somewhat at the 12th. The independent role of *S* increases progressively at the higher grade levels. For Study Habits, however, a very different trend is observed. Here, the common role of *S* and *B* progressively *diminishes* at the higher grade levels, while the independent role of *B increases dramatically*. The independent role of *S* increases at the higher grade levels, too, but to a lesser extent. It appears, then, that at the higher grade levels *S* and *B* come to play independent roles in the development of Study Habits. For both Study Habits and Educational Desires the shifts that occur from the ninth to 12th grades undoubtedly reflect the influence of the dropouts, at least in part.

Figure 11.6.3 shows the grade-level trends for Achievement. The dramatic increase in the common role of *S* and *B* shows that the schools may be having an influence on Achievement that is bound up with the social background of their students. The analyses presented in table 11.4.4 and in chapters 4 and 5 suggest that the schools may be producing more growth in Achievement and related attitudes for high Socio-Economic Status and for white students than for low Socio-Economic Status and nonwhite students.[5] Socio-Economic Status appears to be more heavily involved in this influence process than does Racial-Ethnic Group Membership or Family Structure.

Figure 11.6.4 gives the relative roles played by *S* and *B* in the special 12th-grade Outcome measures. As can be seen from the height of the bar graphs, all of these measures were noticeably less predictable than many of the earlier measures. For Percent of Graduates Going on to a 2- or 4-Year College, *S* and *B* play a large common role, while both *S* and *B* play smaller independent roles, the independent role of *B* being the smallest. A very different trend is observed for Percent Nonwhite Going on to College, Percent of Total Going on to Vocational Training, and Percent of Nonwhite Going on to Vocational Training. For these Outcomes the common role of *S* and *B* and the independent role of *B* are negligibly small. The greatest contribution to these three Outcomes *is* from the independent roles of *S*. For Percent of 10th-Grade Students Who Drop Out of School it will be seen that *S* plays both a large independent role and a common role with *B*. The independent role of *B* is negligible.

We also tried dividing *S* into the three subsets of School Personnel and Personnel Expenditures, Pupil Programs and Policies, and Facilities. Our purpose was to see if any of these subsets was playing a greater role than the others in influencing school outcomes. For Study Habits the same diminishing trend at the higher grade levels was observed for the subsets of *S* as had been observed for *S* itself. For Expectations for Excellence, Attitude Toward Life, Educational Plans, Achievement, and Percent Going on to College, the subset of *S* that was shown to play the greatest independent role was School's Personnel and Personnel Expenditures. It also had a common role with *B*. The subsets concerned with Pupil Programs and Facilities usually made a contribution only when combined with the Student Body and School Personnel variables. For the Percent Nonwhite Going on to College, Percent Total and Percent Nonwhite Going on to Postsecondary Vocational Training, and Percent of Dropouts, these three subsets of *S* each tended to play a greater independent role than *S* as a whole. There was little indication of a common role being played by these subsets, except possibly for that of the Student Body and School Personnel variables with the Percent of Dropouts.

SUMMARY

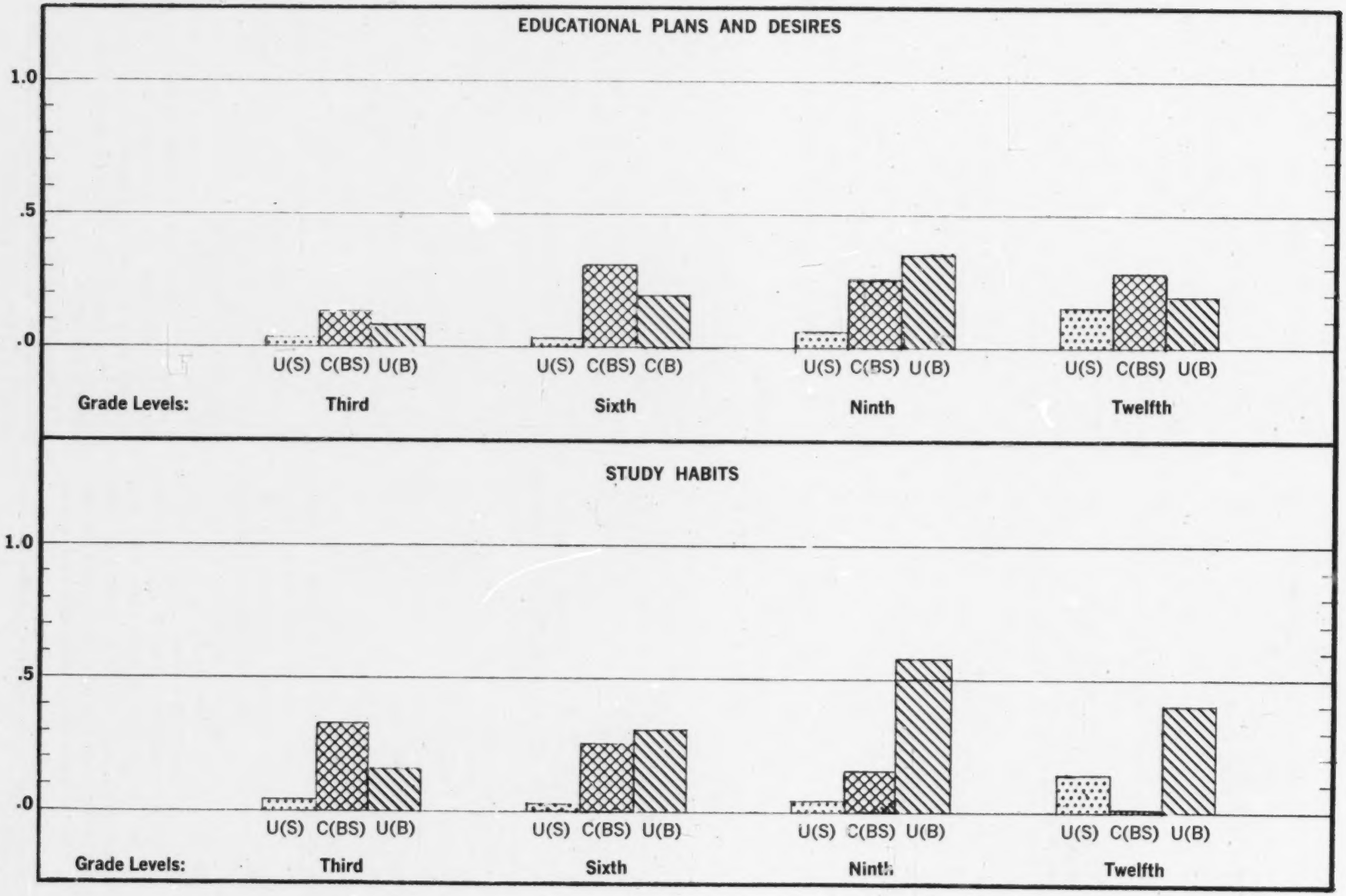
The results of the analyses discussed in section 11.6 show that the Student Body variables (*B*) may play a moderate-to-large role in influencing Expectations for Excellence, Attitude Toward Life, Educational Desires and Plans, and Study Habits. This is not to deny that the School variables (*S*) may also play a role. But it is not nearly as large a one as that of the Student Body variables.

We have also seen that there is a certain amount of variance that is shared by *S* and *B*, and that the extent of this sharing varies with the grade level and Outcome under consideration. Both *S* and *B* play relatively small independent roles in achievement. There may, however, be a dramatic interplay of *S* and *B* in influencing Achievement. These results suggest that neither the kinds of students a school gets initially, nor its resources, as we have defined them, is the sole influence on school outcomes. Instead, both play a role together. Our results seem to show that, for all of these Outcome measures, the school is more successful with white students and students from higher socioeconomic strata than with nonwhite students and students from lower socioeconomic strata. For the remaining Outcome measures—those concerned with Percent Going on to College or Vocational Training and Percent of Dropouts—a much greater role is played by *S* than by *B*. Perhaps by the time students reach the 12th grade the school has more of an influence on them than at the lower grade levels. Certainly, this would be a reasonable inference about those who complete the 12th grade.

The next section attempts to show that much the same kinds of processes operate through time as we have observed for different points in time.

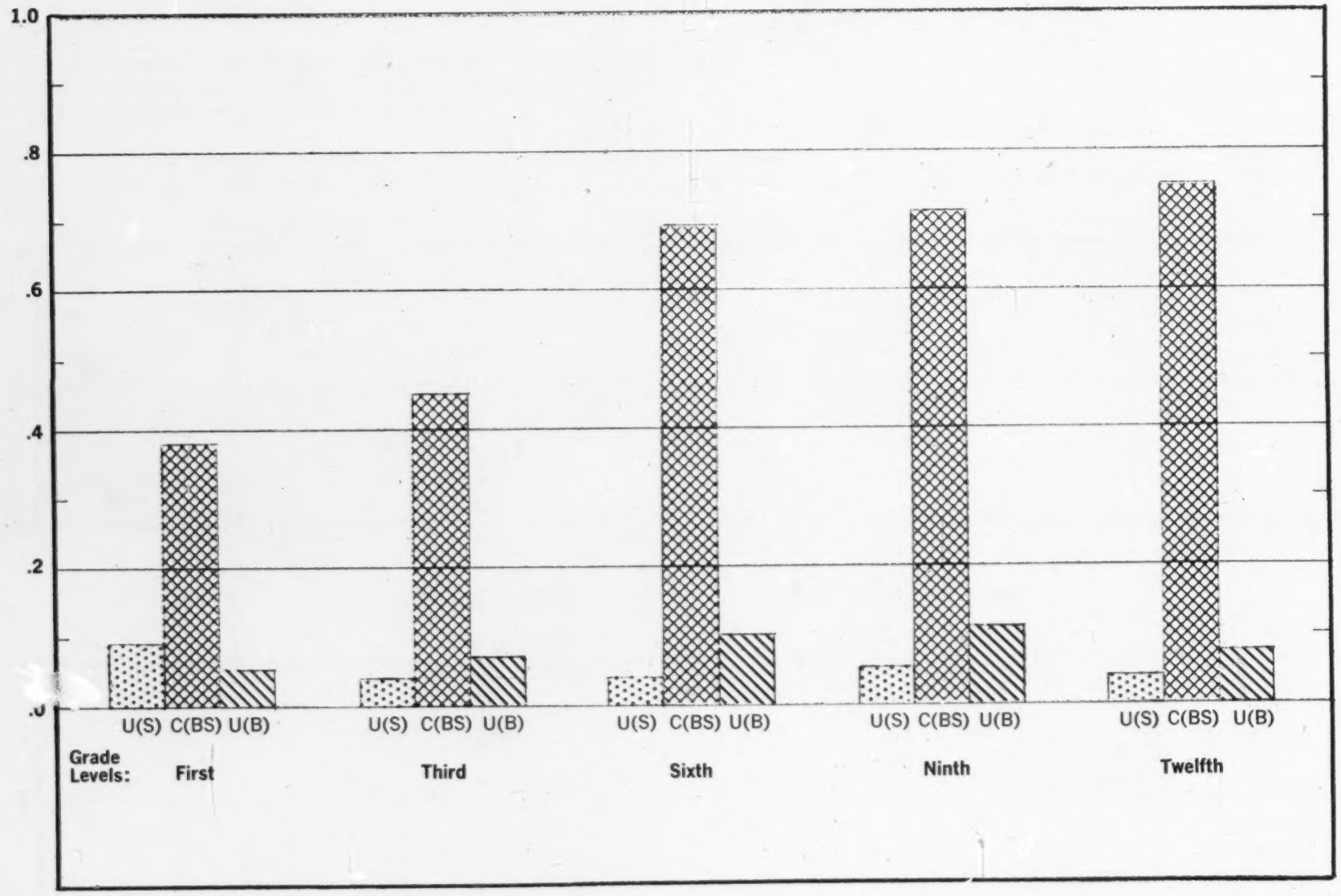
[5] This conclusion is supported by other recent studies (see especially Shaycoft, 1967).

Figure 11.6.2.—Graphical Representation of the Common and Unique Roles Played by the School and Student Body Variables in the Development of Educational Plans and Study Habits



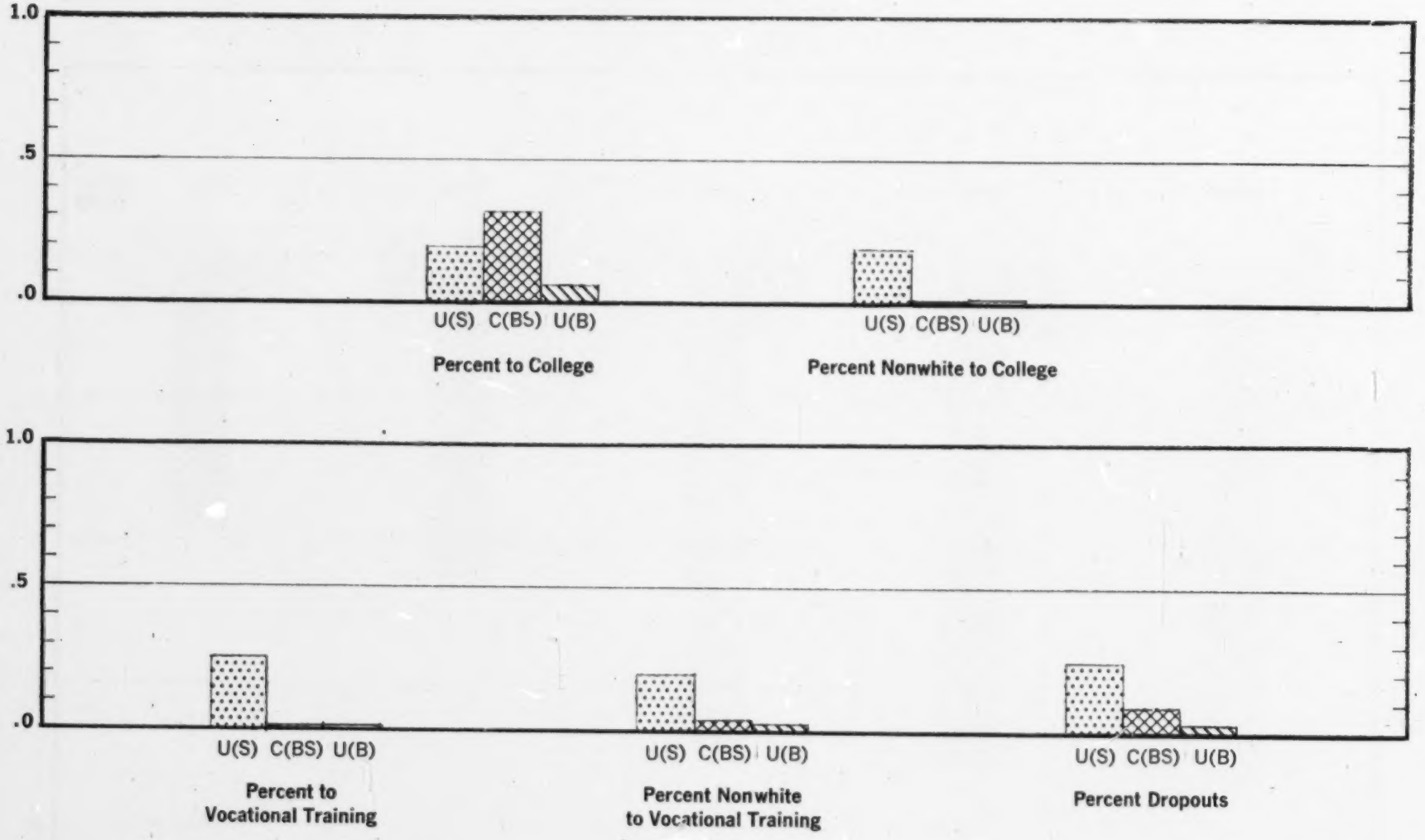
U(S) Unique or independent role of the School.
U(B) Unique or independent role of the Student Body Social Background.
C(BS) Common role of the Student Body Social Background and School.

Figure 11.6.3.—Graphical Representation of the Common and Unique Roles Played by the School and Student Body Variables in the Development of Achievement



U(S) Unique or independent role of the School.
U(B) Unique or independent role of the Student Body Social Background.
C(BS) Common role of the Student Body Social Background and School.

Figure 11.6.4.—Graphical Representation of the Common and Unique Roles Played by the School and Student Body Variables in the Development of the Special 12th-Grade Outcomes



U(S) Unique or independent role of the School.
U(B) Unique or independent role of the Student Body Social Background.
C(BS) Common role of the Student Body Social Background and School.

11.7. SCHOOL INFLUENCES INDEPENDENT OF ENTERING STUDENT'S ACHIEVEMENT LEVEL

Further support would be given to the grade-level trends presented in the previous section if we could show that the same kinds of processes operate through time as we have observed for different points in time. Some of the schools included in this study provided Achievement and questionnaire information on their sixth-, third-, and first-grade students. It was felt that if the nature of the student body did not vary too much between these grades, then the first-grade students could be considered similar to the third-grade and sixth-grade students when they first entered the school. Such an assumption would enable one to correct the achievement levels of the third and sixth grades for their achievement levels when they entered first grade. Any differences remaining after this correction could then be related to different aspects of the school and student body.

Analyses based on this assumption were in fact carried out; their results are given in chapter 8. Commonality analyses determined the independent and common roles of S and B in Achievement gains. A graphical representation of these commonality analyses is given in figure 11.7.1. Here we see that even after the third and sixth grades have been equated for their entering Achievement levels, increasingly common and independent roles are played by S and B in the development of gain in Achievement. Another way of saying this is that the longer the students remain in school, *even though they start out at the same intial level of achievement*, the more predictable their gain in Achievement becomes from the common role of S and B.

Analyses were also conducted using the three subsets of S that we have called F, T, and P. As in the earlier analyses, the greatest independent role, as well as the greatest common role with B, was found for T. The contributions of P and F were negligible.

Do these comparisons of different grades at the same point of time give us the same kinds of results that we would have obtained by comparing the same students at different points in time? A study by Shaycoft (1967) suggests that they do. Shaycoft found that the same students from higher socioeconomic strata showed greater gains on later testing than did the same students from lower socioeconomic strata, even after all students had been equated for their initial achievement levels. This confirms our earlier observation that the social composition of the student body is related to the students' gains in achievement. We showed that the students of schools with higher Socio-Economic Status and predominantly white students made greater gains than the students of schools with lower Socio-Economic Status and predominantly nonwhite schools. We have also shown that the school has both an independent role in promoting achievement gains and a very large common role with the students' social background attributes.

11.8. THE ROLE OF MULTIPLE SCHOOL OUTCOMES

Analyses presented in chapter 4 showed that the School Outcome measures were substantially correlated with one another. Analyses in chapter 6 showed that the School Outcome measures were substantially correlated with one another even after associations attributable to the size of the school and the students' social background had been removed by correlation techniques. We, therefore, decided to analyze the role played by multiple School Outcomes when combined with the set of Student Body variables, on the one hand, and the comprehensive set of 31 School variables, on the other. An overview of these analyses is presented in this section.[6]

Our basic purpose here was to define a third set of variables that we called O, or Other Outcomes. We want to include this third set in the analyses with S and B. At each grade level, therefore, O was made up of measures other than the dependent variable that could be classified as outcomes. At the sixth grade, for example, where Expectations—an Outcome—was used as the dependent variable, the set of Other Outcomes consisted of Attitude Toward Life, Educational Plans and Desires, Study Habits, and Achievement. At the 12th grade the Outcome set was expanded to include the five special measures we used here.[7] Consequently, in the results that follow the set of Other Outcomes for the third, sixth, and ninth grades is composed of four variables, while that for the 12th grade is composed of nine variables.

Commonality analyses using S, B, and O are presented in the following graphs. Since with three sets of variables there are a larger number of commonalities than for two sets, only those commonalities are presented that involve O. For example, $R^2(O)$, or the squared multiple correlation for O, can be partitioned as follows:

$$(6) \quad R^2(O) = C(BSO) + C(BO) + C(SO) + U(O)$$

In this equation $C(BSO)$ is the predictable variance in the dependent variable common to all three sets; $C(BO)$ is the variance common to the B and O sets; $C(SO)$ is the variance common to the S and O sets; and $U(O)$ is the unique portion of the O set in predicting that dependent variable.

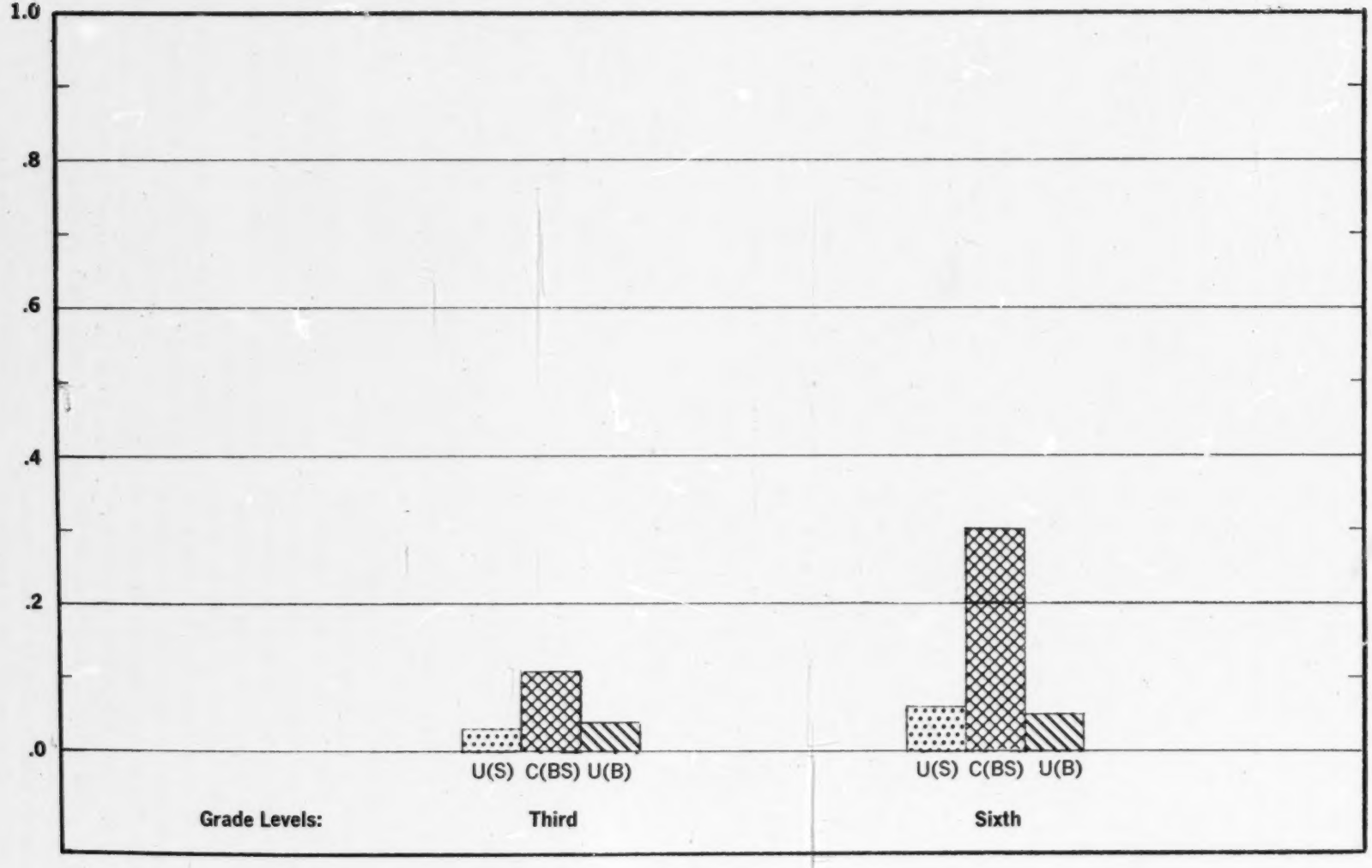
These values are presented in the tables that follow. As before, the height of each bar graph represents the magnitude of the commonality coefficient. Increasingly large values for all coefficients represents an increase in predictability.

Figure 11.8.1 presents these values for Expectations and Attitude Toward Life. For Expectations the unique or independent role of O stays about the same at the different grade levels. The common role of B and O, on the other hand, increases through the ninth grade and then drops sharply at the 12th grade. The common role of BSO increases at the sixth grade and then tapers off at

[6] See chapter 9 for the full analyses.

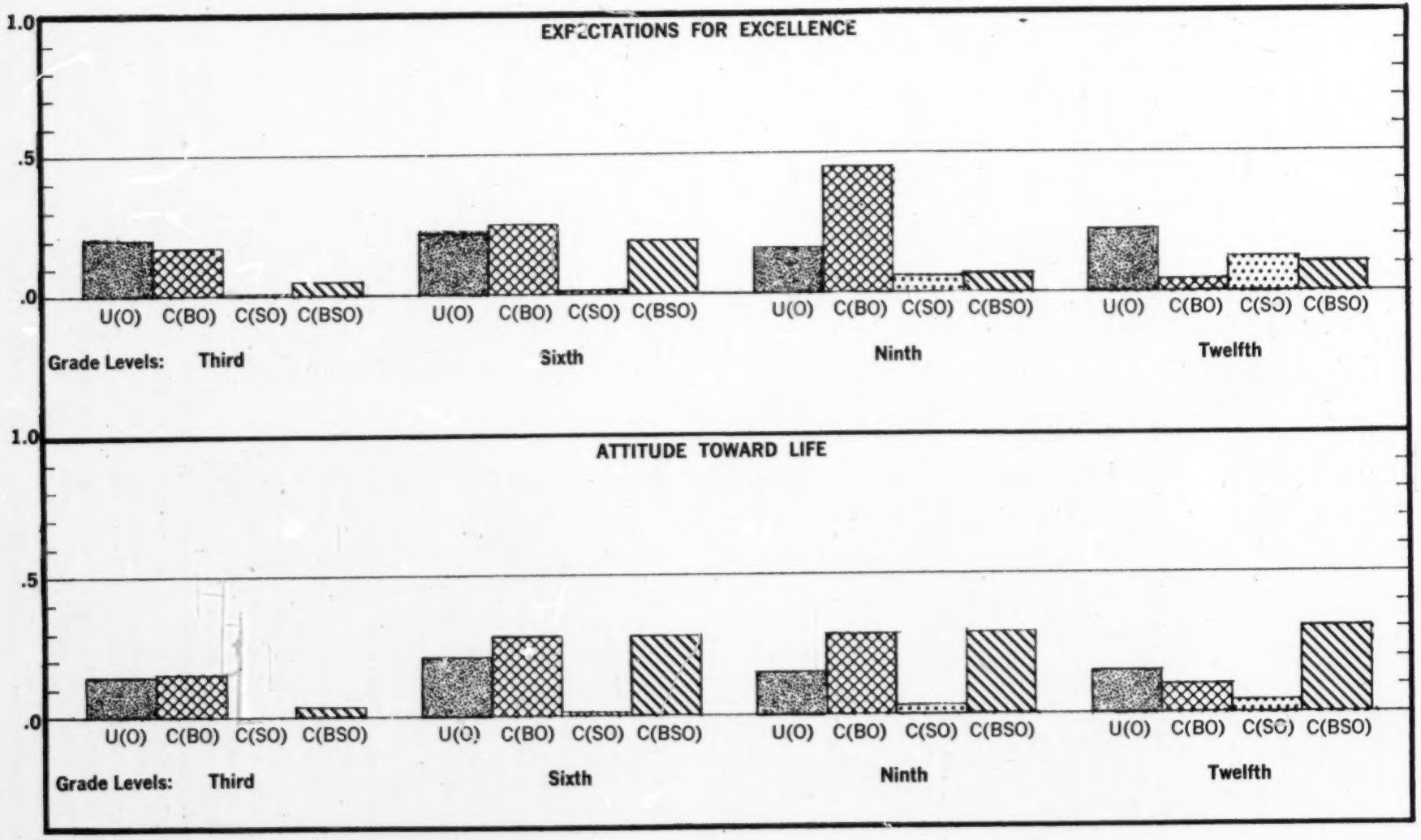
[7] In chapter 9 analyses were tried both with and without these special measures. For simplicity, however, we have concentrated here on analyses that did use them.

Figure 11.7.1.—Graphical Representation of the Independent and Common Roles Played by the School and Student Body Variables in the Development of Gain in Achievement



U(S) Unique or independent role of the School.
U(B) Unique or independent role of the Student Body Social Background.
C(BS) Common role of the Student Body Social Background and School.

Figure 11.8.1.—Graphical Representation of the Independent and Common Roles Played by the Other School Outcomes in the Development of Expectations and Attitude Toward Life



U(O) Unique or independent role of the Other Outcomes.
C(BO) Common role of the Student Body and Other Outcomes.
C(SO) Common role of the School and Other Outcomes.
C(BSO) Common role of the Student Body, School, and Other Outcomes.

the higher grade levels. For Attitude Toward Life the independent role of *O* increases through the sixth grade and then recedes somewhat. The common role of *BSO* increases at the higher grades while the common role for *B* and *O* increases through the ninth grade and then decreases somewhat. For both Expectations and Attitude Toward Life the common role of *S* and *O* is very small, although it does increase slightly at the higher grade levels.

Figure 11.8.2 gives the grade-level trends for Educational Plans and Study Habits. While the independent role of the Outcome set remains fairly similar over the grade levels, the common role of *B* and *O* increases through the ninth grade and then decreases. The common role for *BSO* increases through the sixth grade and then decreases somewhat at the ninth and 12th grade. For Study Habits the common role of *B* and *O* increases through the ninth grade and then decreases, while the common role for *BSO* progressively decreases with ascending grades. The independent role of *O* oscillates, increasing from the third to sixth grade, then decreasing at the ninth only to increase again at the 12th. As with the previous dependent variables, the common role of *S* and *O* is negligible at the lower grades, but does increase slightly at the higher ones.

Figure 11.8.3 gives the grade-level trends for Achievement, which are dramatically different from those of the previous dependent variables. For Achievement virtually all of the predictable variance is explained by the common role of *BSO*. This role increases markedly at the higher grade levels.

Figure 11.8.4 presents the results for the special 12th-grade outcome measures. For Percent of Graduates Going on to College the largest contributions are made by the independent role of *O* and its common role with *B* and *S*. For Percent Nonwhite Going on to College and Percent Nonwhite Going on to Postsecondary Vocational Training the independent role of *O* is still greatest. There is also a slight common role here of *O* with *S*. Percent Going on to Vocational Training and the Percent of Dropouts show negligible relationships with *O*.

We have noted that for Expectations, Attitude, Educational Plans, and Study Habits there is a moderate independent role of *O* and a moderate-to-large common role of *O* with *B* and of all three sets of variables together. The magnitude of these values varies with the grade level under consideration. The common role of *S* and *O* is usually small for these attitudinal and motivational measures. For Achievement, if any influence is wielded by *O* at all it is through its common role with *B* and *S*. The independent role of *O* is negligible for Achievement. For the special 12th-grade measures the Other Outcomes (*O*) play a small independent role for Percent Going on to College and Percent Nonwhite Going on to College, and Percent Nonwhite Going on to Vocational Training. For the Percent Going to College, *O* has a moderate common role with *B* and *S*. The correlations among the Outcomes show that schools that do well on one school outcome tend also to do well on other school outcomes. The commonalities show that these outcomes are bound up with the student body's social background, as we have defined it. Nor is this all. The independent and common roles suggest that *these multiple outcomes are mutually reinforcing and perhaps even mutually facilitating.*

We could delete the "perhaps" from this assertion if we could show that these outcomes became more highly correlated over time. Table 11.4.1 (p. 95) shows that although there was in fact a trend of this sort it was not pronounced, and tended to diminish at the higher grade levels. It was suggested that opposing trends such as dropouts, response errors, and real changes related to the Expectations of nonwhite students operated here to mask what might otherwise have been a more discernible trend.

11.9. SCHOOL PERSONNEL AND PERSONNEL EXPENDITURES

The two sets of variables most heavily involved in school outcomes, in addition to the Student Body variables, were the Other Outcomes, discussed above, and the set we have called School Personnel and Personnel Expenditures, or *T*. In view of *T*'s importance we decided to conduct a special analysis by expanding it to include some more personnel-related variables, and then breaking it up into subsets. We hoped to see if some of the subsets were more heavily involved in school outcomes than others.

The three subsets so formed were:

Fiscal or Expenditure Related Variables—A subset of five variables pertaining to the teacher's and principal's salary levels and training and to the school's specialized staff and services, if any;

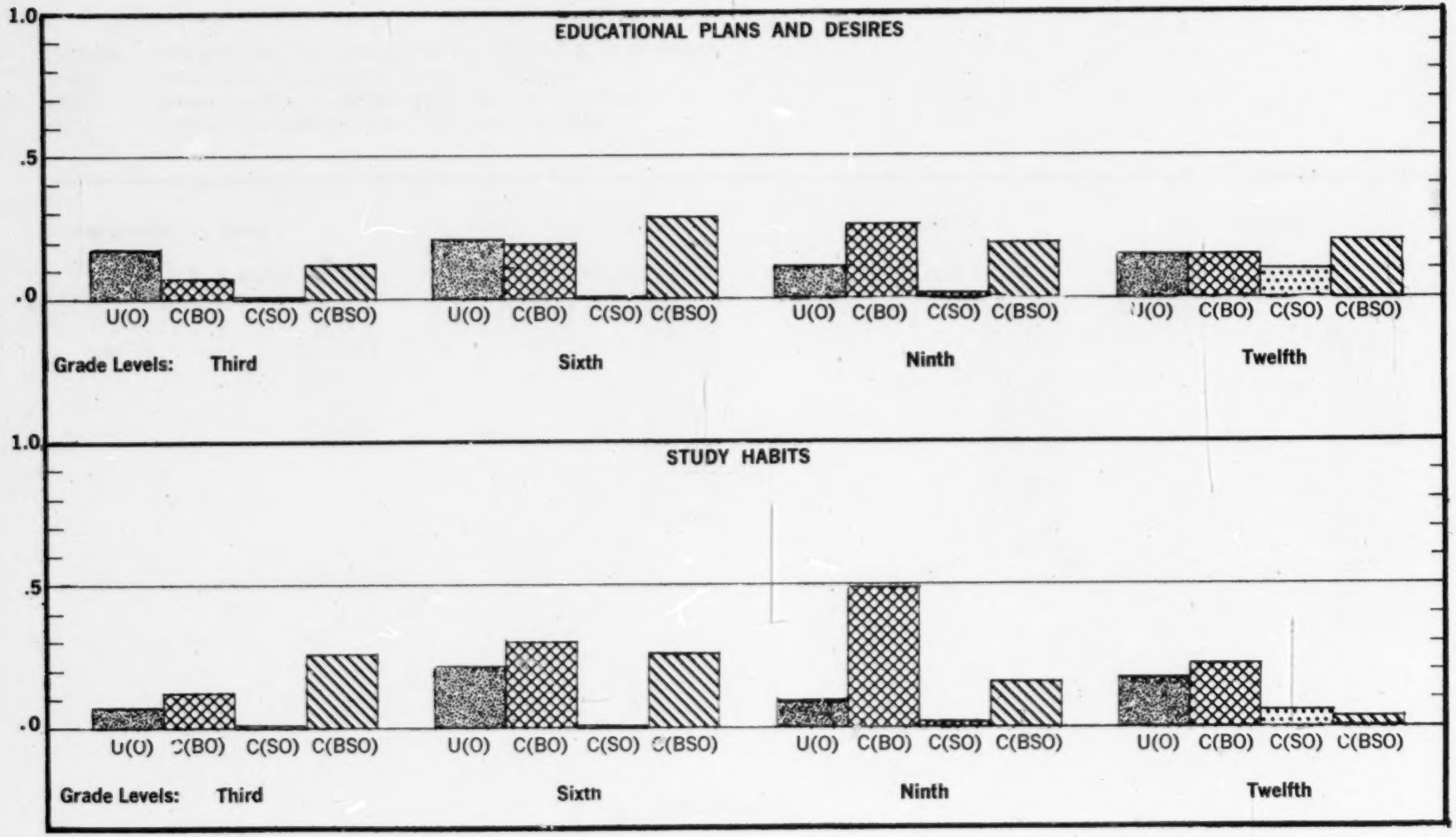
School Personnel's Prior Background and College Attended—A subset of 11 variables referring to the school personnel's Experience, kind and racial composition of College Attended, Localism, Socio-Economic Background, Racial-Ethnic Group Membership, and Vocabulary Score;

Teaching Situation—A subset of 11 variables referring to scope and severity of school problems (e.g., destruction of property, physical violence), the school's reputation among other educators in the area, the rate of teacher turnover, the presence of a tenure system, use of examinations in appointing teachers, the teacher's view of how hard the students try to achieve, the teacher's preference for high-ability students, percent white of teacher's students, and several others.

In order to depict the common role played by these sets with the social background of the students, Student Body Social Background (*B*) was included in these analyses as the fourth set.

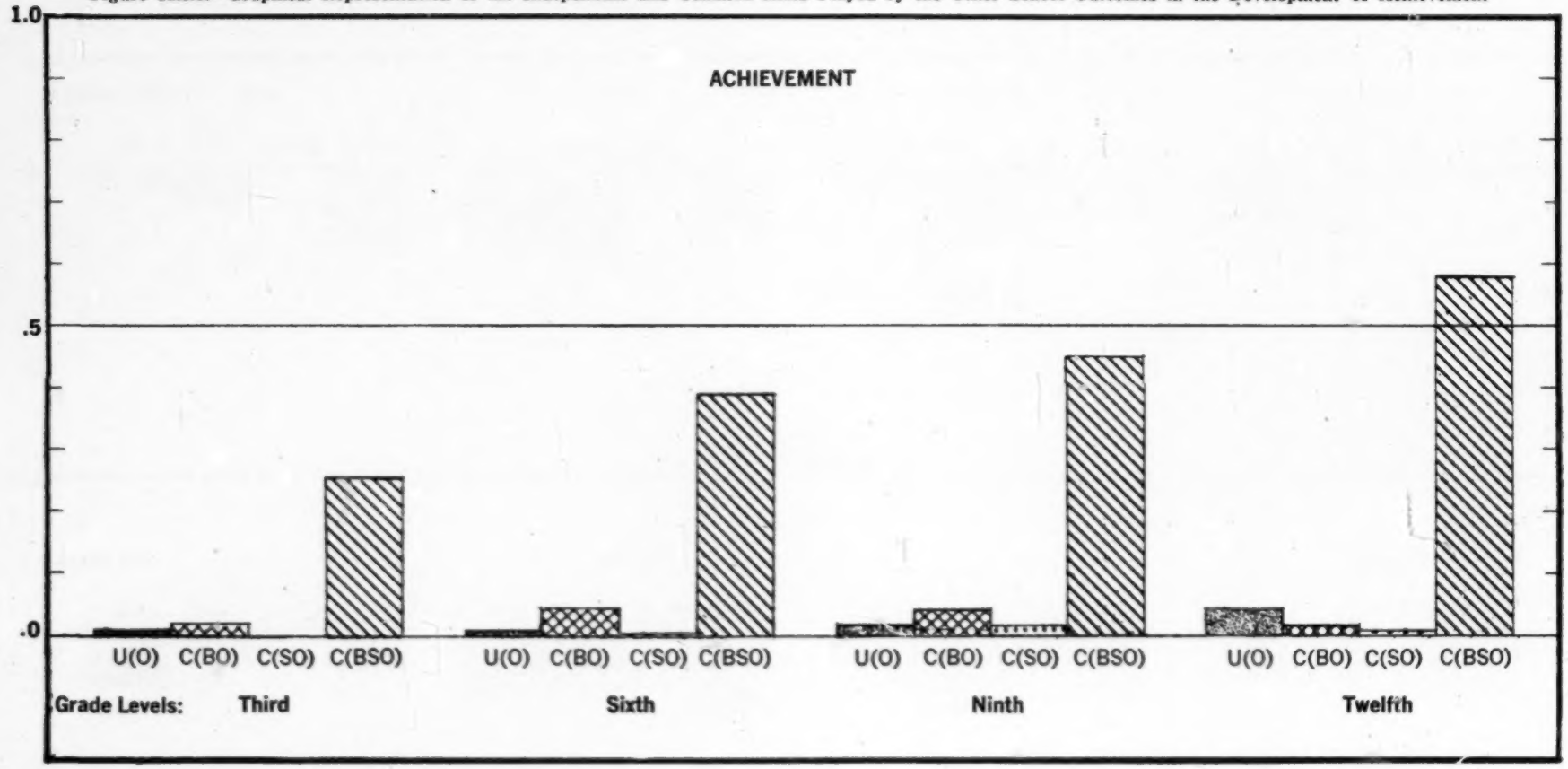
The Outcome measures or dependent variables were the same as those used in earlier analyses; viz, Expectations for Excellence, Attitude Toward Life, Educational Plans and Desires, Study Habits, Achievement, and the five special 12th-grade outcome measures (p. 41). Re-

Figure 11.8.2.—Graphical Representation of the Independent and Common Roles Played by the Other School Outcomes in the Development of Educational Plans and Study Habits



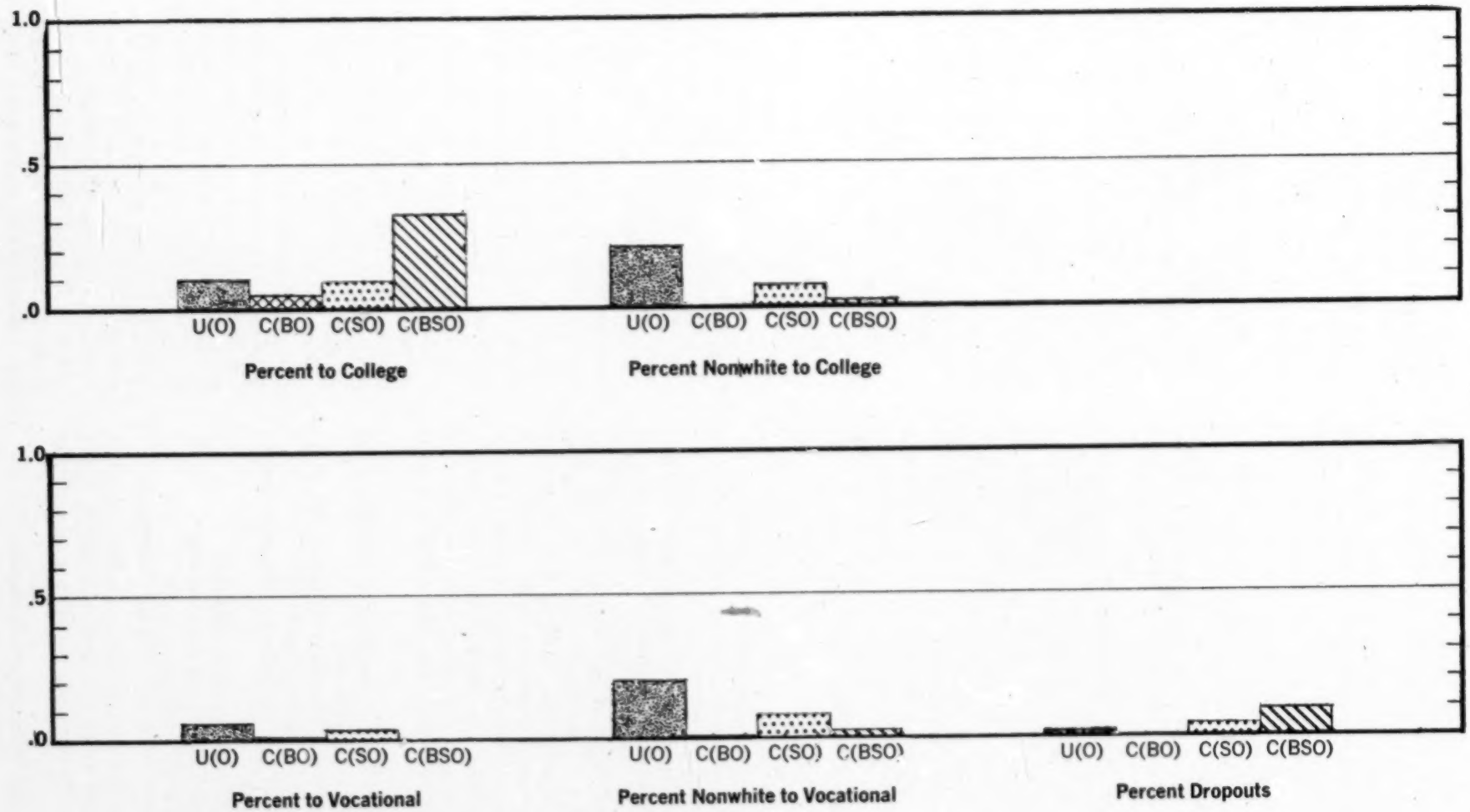
U(O) Unique or independent role of the Other Outcomes.
C(BO) Common role of the Student Body and Other Outcomes.
C(SO) Common role of the School and Other Outcomes.
C(BSO) Common role of the Student Body, School, and Other Outcomes.

Figure 11.8.3.—Graphical Representation of the Independent and Common Roles Played by the Other School Outcomes in the Development of Achievement



U(O) Unique or independent role of the Other Outcomes.
C(BO) Common role of the Student Body and Other Outcomes.
C(SO) Common role of the School and Other Outcomes.
C(BSO) Common role of the Student Body, School, and Other Outcomes.

Figure 11.8.4.—Graphical Representation of the Independent and Common Roles Played by the Other School Outcomes in the Development of the Special 12th-Grade Outcomes



U(0) Unique or independent role of the Other Outcomes.
C(BO) Common role of the Student Body and Other Outcomes.
C(SO) Common role of the School and Other Outcomes.
C(BSO) Common role of the Student Body, School, and Other Outcomes.

gression and commonality analyses[8] were conducted, using these outcome measures and the previously mentioned four sets of variables.

The four-set commonality analyses showed that for Expectations for Excellence, Attitude Toward Life, Study Habits, and Achievement, Fiscal- or Expenditure-Related variables made a very small if not nonexistent contribution. Its influence with the other three sets was also virtually nonexistent. However, both School Personnel's Prior Background and Teaching Situation were strongly involved with Student Body Social Background in predicting these outcomes. The role played by these sets was usually a common one, although there were also some independent roles at times.

For the special set of 12th-grade outcome measures the relative as well as the independent contribution of School Personnel's Prior Background and Teaching Situation was somewhat increased. Nevertheless, the same trends tended to prevail as for the outcomes below 12th grade. Most of the possible influences on the 12th-grade outcomes could be attributed to the independent and common role of the same sets of variables, though the Student Body variables generally played a lesser role.

These results suggest that moderate-to-large increases in personnel expenditures (that is, increases in staff salaries and in the specialized staff) may result in only small improvements in school outcomes. As for the possible effects of *very* large increases, all we can say on the basis of this report is that we do not know what their result would be. Large-scale educational experimentation would be needed to answer this and other questions of the same type.

The set of Fiscal- or Expenditure-Related Variables did not appear to have much of a relationship with the school outcomes. Yet the motivational and attitudinal outcomes, at least, were moderately predictable from School Personnel's Prior Background and Teaching Situation, while Achievement was highly predictable from these same sets. Wondering what it was about these sets that led to their heavy involvement in school outcomes, we examined the correlation of the variables comprising the sets with the school outcomes. We found that the following variables were consistently related to the outcomes:

(1) The teacher's view of his teaching conditions (an index called Teaching Conditions);
(2) The teacher's' Racial-Ethnic Group Membership;
(3) The teacher's Vocabulary Score;
(4) Percent of White Students at Teacher's Undergraduate Institution;
(5) Percent White of Teacher's Students;
(6) Socio-Economic Status of the students;
(7) Student's Family Structure;
(8) Racial-Ethnic Composition of the students.

In the analyses summarized in this section variables 2 through 4 on the above list were included in School Personnel's Prior Background, variables 1 and 5 were included in the Teaching Situation, while variables 6 through 8 were included in Student Body Background. The important points to note are:

(1) These variables are correlated both with one another and with the School Outcomes;
(2) It is these correlations that account, in part, for the common role of the different sets of variables.

These considerations suggest that if we could reduce the dependence of schools on the social background of their students and personnel (that is, if we could achieve a greater socioeconomic and racial balance between students and staff), educational kinds of variables—the teacher's training, for instance, or the school's physical facilities—might then play a greater role in school outcomes.

We also studied the development of variables for individual teachers. These variables had already been shown to be related, as aggregate variables, to School Outcomes. For example, the average Vocabulary Score attained by the teachers in a school had been shown to be related to the average Achievement of the students in the school. Our purpose this time was to study the variables correlated with the individual teacher's Vocabulary Score when the teachers were not aggregated or averaged by school.

We also studied the percent of total variance for different teacher variables that was associated with the schools in which they were located. The variables most highly associated with school differences were those that reflected conditions of racial and ethnic imbalance: the racial composition of the teacher's College Attended, Percent White of Teacher's Students, and Teacher's Racial-Ethnic Group Membership. Still other variables that had moderate-to-high associations with school differences were Teacher's Annual Teaching Salary, Vocabulary Score, and Teaching Conditions (the teacher's own view of how much effort the students put forth, the relative absence of school problems such as racial tension, physical violence against teachers, etc.).

Correlations among the different teacher variables, using the individual teacher as the unit of analysis, showed that those variables concerned with the Teacher's Racial-Ethnic Group Membership, experience in racially imbalanced situations, and Vocabulary Score were most frequently associated with the other teacher variables.

Vocabulary Score was shown to be related to a number of school outcomes as an aggregate variable, and to be correlated with many of the individual teacher variables. We therefore decided to classify these variables under three heads corresponding to successive stages in the career development of a teacher, and then see what part was played by variables at each stage in the development of Vocabulary Score. The three sets of variables or stages were Teacher's Background, Characteristics of Schools Attended, and Teaching Situation. Variables related to teacher's Racial-Ethnic Group Membership, Percent of White Students at Teacher's Undergraduate Institution, and Percent White of Teacher's Students were first in-

[8] A full account of these analyses is given in chapter 10.

cluded in the analysis and then excluded from it in order to show what influence they had in the prediction of Vocabulary Score. We found that it was the racial-ethnic variables that had the greatest influence. The same variables were also giving rise to the common roles of the three "career" sets. When these sets were analyzed separately with Vocabulary Score it was found that Teacher's Racial-Ethnic Group Membership played the greatest independent role, as well as a large common role with Percent White of Undergraduate Institution and Percent White of Teacher's Students.

A graphical illustration of these results is given in figure 11.9.1. The solid and dotted lines represent the correlational relationships for Elementary and Secondary teachers, respectively, and the magnitude of the correlations are given adjacent to each line. We can infer from this table that there is a color-caste system in the teaching profession. By this is meant that nonwhite students attend predominantly nonwhite educational institutions from which some emerge as teachers who teach predominantly nonwhite students. The system is caste-like inasmuch as it is not only self-perpetuating but probably self-reinforcing as well. Mechanisms of self-reinforcement may be present in the perpetuation of differential verbal skills. Thus, nonwhites tend to be born into the lower strata of society where there are fewer family- and school-related experiences that facilitate the development of verbal skills acceptable to the schools. These nonwhites in turn attend predominantly nonwhite educational institutions where there is less of a motivational and achievement orientation (section 4.3.7). The result is a less adequate preparation for teaching. This poorer preparation is then carried into a predominantly nonwhite teaching situation where it is passed on to rising generations of nonwhite students, including nonwhite future teachers.

11.10. OVERVIEW AND HYPOTHESES

The general results of these analyses can be summarized in the form of hypotheses. These are not hypotheses in a rigorous logical sense; in some cases they include brief explanations of what is being hypothesized, and in no case have they been reduced to the most economical formula we could have devised. We believe, however, that they give a fair idea of what we have so far been able to discover. It should be noted that all the terms used here have precise technical meanings in the context of the study. Thus, "student's social backround" refers to the three student body variables of Socio-Economic Status, Family Structure, and Racial-Ethnic Composition. The terms "school" and "school influences" refer to the comprehensive set of 31 school variables "Attitudinal and motivational outcomes" refers to the outcomes at each grade level other than Achievement. "Generalized favorable performance" and "performing well" refer to the correlations that exist among the different outcome measues. An "independent" role, influence, or contribution and a "distinguishable" influence both refer to the unique portions. A "common" role, influence, or contribution and an "indistinguishable" influence refer to the commonalities.

Hypothesis 1

The influence of the schools is bound up with the social background of the students that they get initially.—Very little influence of the schools can be separated from the social background of their students, and very little of the influence of social background can be separated from the influence of the schools. The schools, as they are currently constituted, produce more learning and foster greater motivation when they have a high proportion of students who: (1) come from the higher socioeconomic strata rather than from the lower socioeconomic strata; (2) have both parents in the home rather than only one or neither parent in the home; (3) are white or Oriental-American rather than Mexican-American, Indian American, Puerto Rican, or Negro.

Hypothesis 2

The social background of the students usually plays a greater independent role in the development of all school outcomes than do the independent influences of the school —until the 12th grade.—At the 12th grade the independent influence of the school is greater than the independent influence of the student's social background for most of the motivational and attitudinal outcomes, but not for achievement. What happens at the 12th grade is that the influence of the student's social background for achievement still outweighs the school influence.

Hypothesis 3

For all the attitudinal and motivational outcomes, the school has a common influence with the student's social background that varies in magnitude with the particular outcome and grade level under consideration. For achievement, however, the school has a common influence with the student's social background that increases the longer the students stay in school and that is much greater than their independent contributions.

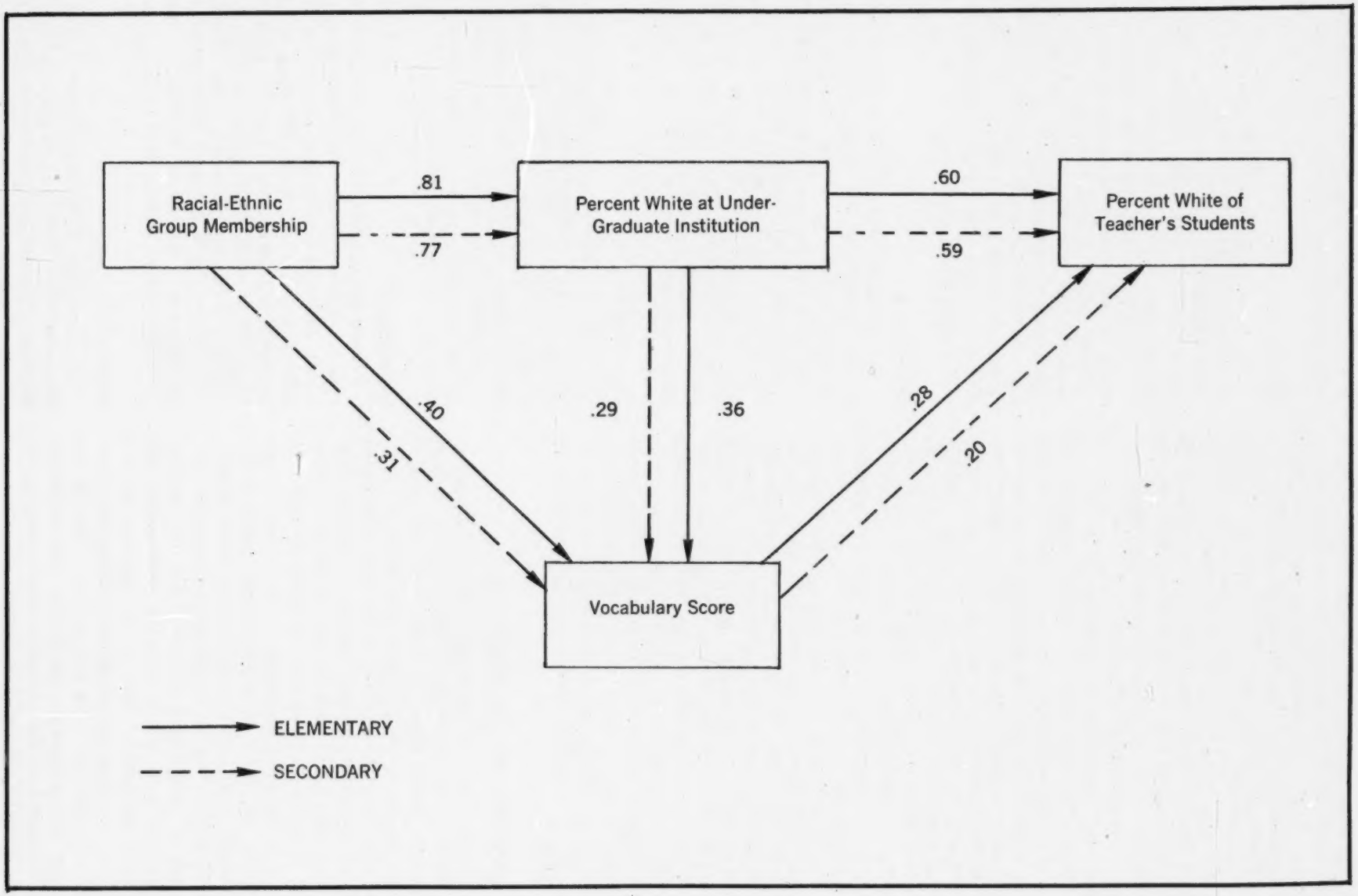
Hypothesis 4

Schools that perform well on one school outcome also tend to perform well on other school outcomes.—In other words, favorable performances tend to facilitate and reinforce one another. For the attitudinal and motivational outcomes, this generalized favorable performance has a large independent contribution as well as a common influence with the student's social background. For achievement, the influence of this generalized favorable performance is manifested in common with the school characteristics and the student's social background.

Hypothesis 5

The attributes of the school most heavily involved in school outcomes, both independently and in common with the student's social background, are those concerned with the school's personnel.

Figure 11.9.1.—Graphical Illustration of the Correlational Relationships That Exist Between the Teacher's Racial-Ethnic Group Membership, Racial Composition of Teacher's Undergraduate Institution and of Teacher's Students, and Teacher's Vocabulary Score



Hypothesis 6

The school's physical facilities, pupil programs, and policies have small-to-negligible independent influences on school outcomes.—However, they do have slight common contributions in conjunction with student's social background and school personnel.

Hypothesis 7

Variables concerned with the school's personnel expenditures, such as teaching salaries, have negligible relationships with school outcomes, either independently or in common with the other school variables and the student's social background.

Hypothesis 8

Teacher attributes highly related to school outcomes were those reflecting a teacher's experiences in racially imbalanced educational settings.—Nonwhite teachers attend predominantly nonwhite educational institutions and teach predominantly nonwhite students. Nonwhite educational settings tend to have associated with them lower levels of achievement and motivation, as well as less favorable socioeconomic and family conditions. The result is a less adequate preparation than that received in predominantly white institutions.

One aspect of these findings can be summarized as follows:

> For both students and teachers, the American educational system reflects the structure of American society. It, therefore, tends to perpetuate and even further increase the differential learning experiences that students bring to the educational setting by virtue of their birth.

11.11. SUGGESTIONS FOR FUTURE RESEARCH

It should be clear by now that, in the experimentally uncontrolled situation called "real life," it is well-nigh impossible to separate the influence of environmental resources that facilitate the development of achievement from the motivation to achieve. We must conclude, then, that none of our analyses can tell us in any *specific* way how much of a change will occur in certain school outcomes if certain school resource inputs are systematically altered. In our opinion, specific answers to questions of this type can be obtained only by studying the performance of students in situations where the outcomes and resource inputs *can* be specified precisely, and in which the resource inputs can be manipulated systematically. Survey research, whether longitudinal or conducted at one point in time, can be useful only in suggesting hypotheses for further research. It is of little value in demonstrating the possible efficacy of different educational interventions and innovations.

This should not be construed to mean that cross-sectional and longitudinal surveys are useless. When coupled with large-scale educational experiments they can be powerful tools for evaluating the effectiveness of different educational programs. For example, even this survey, through further analysis of how schools and teachers influence students with different backgrounds, might suggest the optimal social composition of a student body for obtaining a desired level of achievement. This optimal value might then be validated by experimental research with groups having this composition.

11.12. SOME ISSUES AND RECOMMENDATIONS

11.12.1. Do schools influence their students' achievement levels and attitudes?

An earlier report entitled *Equality of Educational Opportunity* (Coleman et al., 1966) concluded that the schools were having very little influence on the students that was independent of their family background. This was misconstrued by some people to mean that the schools were not having an influence, and that they were therefore not important. There were even those who argued that not only was it not important which school a student attended but that it wasn't even necessary for them to attend school.

We have attempted to show that the schools do indeed have an important influence on their students. It appears, however, that much of this influence is bound up or manifested in conjunction with the student's social background. If we had been able to study students who had had their schooling interrupted for a substantial period, or who had matured without the benefit of any schooling at all, we would have been able to demonstrate what we have here shown only through extended analysis. A study of Negro children in Prince Edward County, Va., where the schools were closed for several years, does just what we were unable to do. These investigators (Green et al., 1964) found that children who had gone for a few years without ever having started school could not even hold a pencil, let alone follow detailed instructions or take a test. The test performance of children whose schooling had been interrupted was compared with that of Negro children in a neighboring county who were of similar socioeconomic and rural background. It was found that the children whose schooling had been interrupted exhibited severe educational retardation, particularly on tests more closely related to school curriculums such as spelling and arithmetic. On an intelligence test the scores of these children were 15 to 30 points lower than those of the children in the adjacent county who had continued in school.

Clearly, the schools do have important influences. Just as clearly, one of the goals in improving the schools must be to increase the influence they have on their students that is independent of the students' social background—their educational influence, in short.

11.11.12. How can the educational influence of the schools be increased?

There are a variety of educational innovations that are currently being experimented with and still others that are awaiting trial. However, unless there exists a systematic framework of objectives within which the

effectiveness of such programs can be assessed, it will be difficult to say just how beneficial they are or can be. Even after the value of new techniques has been demonstrated, and the techniques incorporated in the operating situation, their performance requires periodic monitoring.

One example of a systematic approach to the management of schools in terms of a number of performance criteria has been developed for the State of Pennsylvania and is currently being implemented by them (see Educational Testing Service, "A Plan for Evaluating . . . ," 1965). An approach such as this may in and of itself increase the influence that schools have on their students. But in any case it would be indispensable. If a school cannot specify how much and in what ways it has improved, then how can it justify its claims to school board members, parents of students, etc. that it *has* improved? It seems likely, then, that management of schools in terms of explicit objectives and performance criteria is one major innovation that may result in improved school performance.

Another such innovation can be put in the form of a question, as follows. How can a society that is committed to equality for all, in all aspects of its life, expect to achieve that equality when its educational enterprise not only reflects but perpetuates an inequitable social structure? Our analyses have suggested that the extraordinary aggregation of students into schools on the basis of their race, ethnicity, and socioeconomic background precludes the attainment of an open society. Indeed, if the dependence of the school on the social background of their students could be lessened (viz, if student bodies were more balanced or better mixed in terms of their social backgrounds) then, in the language of our analysis, educational kinds of variables might make a greater relative contribution to students' achievement levels and motivation.

We have not attempted in this report to delve into the influence of the schools on subgroups of their students. But a recent review of the research on desegregation by Weinberg (1968) suggests that more racially balanced schools can enhance the achievement levels of Negro students without detracting from those of the whites. In view of these considerations, it is suggested, more racially and socioeconomically balanced schools will have a greater influence on their students. How best to achieve this balance might itself be a subject of inquiry or experimentation. For example, open housing (perhaps coupled with an income supplement to make the housing purchasable), relocation of school boundaries, and busing of students from imbalanced schools can all result in more homogeneous student bodies. The effectiveness of these different approaches in terms of such criteria as racial tension, student learning, etc. could then be ascertained.

There is no doubt that a wide variety of different approaches to the improvement of school influences need to be experimented with. Some of these are concerned with the acceleration of the learning rates of slow learners through more individualized instruction. Still others are concerned with introducing more competition into schools by having competing school systems (Coleman, 1967; Clark, 1968). Another approach might focus on the skills, attitudes and training of the teacher as they impinge upon student performance. Yet another might focus on parental involvement in the child's school work and perhaps even on parental control of the schools. In short, there does not appear to be any single variable, as of this writing, by which we can transform the achievement levels of lower achieving schools so that they can "catch up" with the higher achieving schools in a few years. Rather, we are embarking upon a longer voyage into an only partially explored ocean. There is some consensus among the crew as to where we would like to go, but no one is quite sure of the best way to get there.

List of References

Beaton, A. E., Jr., "Paper presented at an Eastern Regional Meeting of the American Sociological Association, May 1968."

———., "Criterion scaling of questionnaire items for regression analysis." Paper presented at a U.S. Office of Education sponsored symposium on Operations Analysis of Education, Washington, D.C., November 1967.

———., "The Use of Special Matrix Operators in Statistical Calculus." Research Bulletin 64–51, Educational Testing Service, Princeton, N.J., 1964.

Boocock, S. S., "Toward a sociology of learning: a selective review of existing research." Sociology of Education, 1966, 39(1).

Clark, K. B., "Alternative public school systems." Harvard Educational Review, 1968, 39(1), 100–113.

———., et al., *Equality of Educational Opportunity.* Washington: U.S. Government Printing Office, 1966.

Coleman, J. S., "Toward open schools." The Public Interest, 1967, 20–27.

Dyer, H. S., "School factors and equal educational opportunity." Harvard Educational Review, 1968, 38(1), 38–56.

Educational Testing Service. "A Plan for Evaluating the Quality of Educational Programs in Pennsylvania." Volumes I, II, and III being a report from the Educational Testing Service to the State Board of Education, June 30, 1965.

Flanagan, J. C., et. al., *Studies of the American High School.* Pittsburgh, Pa., University of Pittsburgh, 1962.

———., *The American High School Student.* Pittsburgh, Pa., University of Pittsburgh, 1964.

Green, R. L.; Hofmann, L. J.; Hayes, M. E.; Morgan, R. F., "The Educational Status of Children in a District Without Public Schools." U.S. Office of Education Cooperative Research Project No. 2321, 1964.

Horst, P., *Factor Analysis of Data Matrices.* New York: Holt, Rinehart and Winston, 1965.

Kaiser, H. F., "The application of electronic computers to factor analysis." Educational and Psychological Measurement, 1960, 20, 141–151.

———., "The varimax criterion for analytic rotation in factor analysis." Psychometrika, 1968, 23, 187–200.

Lyle, J. R., "Research on achievement determinants in educational systems: a survey" Socio-Economic Planning Sciences, 1967, 1, 143–155.

Mayeske, G. W., and Weinfeld, F. D., "Factor analysis of achievement measures from the Educational Opportunities Survey" Technical Note No. 21, U.S. Office of Education, Washington, D.C., 1967.

———.; ———.; and Beaton, A. E., Jr., "Item response analyses of the Educational Opportunities Survey teacher questionnaire." Technical Note No. 32, U.S. Office of Education, Washington, D.C. 1967.

———.; Tabler, K. A.; Proshek, J. M.; Weinfeld, F. D.; and Beaton, A. E., Jr., "Item response analyses of the Educational Opportunities Survey Principal questionnaire." Technical Note No. 58, U.S. Office of Education, Washington, D.C., 1968.

———.; ———.; Weinfeld, F. D.; Beaton, A. E., Jr.; Proshek, J. M. "Correlational and Regression Analyses of Differences Between Achievement Levels of Ninth-Grade Schools from the Educational Opportunities Survey." Technical Note No. 61, U.S. Office of Education, Washington, D.C., 1968.

———.; Weinfeld, F. D., Beaton, A. E., Jr.; Davis, W.; Fetters, W. B.; Hixson, E. E., "Item response analyses of the Educational Opportunities Survey student questionnaire." Technical Note No. 64, U.S. Office of Education, Washington, D.C., 1968.

McNemar, Q., *Psychological Statistics*, New York: John Wiley and Sons, Inc., 1955.

Okada, T.; Stoller, D. S.; and Weinfeld, F. D., "Dynamics of achievement: a study of differential growth of achievement over time." Technical Note No. 53, U.S. Office of Education, Washington, D.C., 1968.

———., and ———., "Dynamics of achievement: differential growth of achievement for Negro and White students by SMSA/Non-SMSA and region." Technical Note No. 54, U.S. Office of Education, Washington, D.C. 1968.

Robinson, W. S., "Ecological correlations and the behavior of individuals." American Sociological Review, 1950, 15(3), 351–357.

Shaycoft, M. F., *The High School Years: Growth in Cognitive Skills.* Pittsburgh, Pa.: American Institutes for Research and School of Education, University of Pittsburgh, 1967.

Thorndike, R. L., *Personnel Selection.* New York: John Wiley and Sons, Inc., 1949.

———., *The Concepts of Over- and Under-Achievement.* New York; Teachers College, Columbia University, 1963.

Weinberg, M., *Desegregation Research: An Appraisal.* Bloomington, Ind.: Phi Delta Kappa, 1968.

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